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Vol. 51 SEPTEMBER, 1939 No. 3

The Wilson Bulletin

Published by the

Wilson Ornithological Club

Ann Arbor, Michigan

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THE WILSON BULLETIN

is published quarterly in March, June, September, and December, as the official organ of the Wilson Ornithological Club, at Ann Arbor, Michigan, and is sent to all members not in arrears for dues. The subscription price is $1.50 a year, invariably in advance, in the United States. Single numbers, 50 cents. Outside of the United States the rate is $1.75. Single numbers, 60 cents. Subscriptions should be sent to the Editor.

All articles and communications for publication, books and publications for review, exchanges, and claims for lost or undelivered copies of the magazine, should be addressed to the Editor.

The current issue of *The Wilson Bulletin* is printed by the Ann Arbor Press, Ann Arbor, Michigan.

Entered as second class matter July 13, 1916, at Ann Arbor, Michigan, under Act of Congress of March 3, 1879.

THE WILSON ORNITHOLOGICAL CLUB

Founded December 3, 1888. Named after Alexander Wilson, the first American ornithologist, and called the "Father of American Ornithology."

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THE WILSON BULLETIN
A QUARTERLY MAGAZINE OF ORNITHOLOGY
Published by the Wilson Ornithological Club

Vol. 51 SEPTEMBER, 1939 No. 3

DISTRIBUTION OF THE AMERICAN TREE SPARROW[1]

BY A. MARGUERITE BAUMGARTNER

THE preparation of maps depicting the distribution of an animal species is by its very nature a compilation of a great many papers and observations by others. During five months an average of twenty hours a week was spent in the stacks of the Cornell University Library, sifting out records from the extensive zoological literature buried therein. Records were taken from the numerous State and Provincial faunal works, and from hundreds of local lists. A total list of the references on which these maps of the winter and breeding ranges of the Tree Sparrow (*Spizella arborea*) are based would fill many pages, and the bibliography appended represents only those titles actually referred to in the text.

In regions from which little information about Tree Sparrows has been published an effort was made to secure it by addressing members of the American Ornithologists' Union who reside there. For the generous response to these inquiries the author wishes to extend her heartfelt thanks. Additional records or corrections will be welcomed.

A. The Species

1. The Winter Range

The winter distribution and abundance of the Tree Sparrow, in inhabitable country, have been fairly well determined. On the map I have outlined the normal range by broken lines and shaded to indicate comparative abundance as well as could be determined from such indefinite terms as "common" and "rare." Specific stations have been plotted only on the borders of its range and in States, especially in the mountainous districts of the West, where there are only scattered records. A number of stations, it may be observed, have been left outside the zone of regular occurrence. These have been single records, of one bird or a small group never before recorded in that region, indicating, I believe, stragglers rather than an extension of the range of the species. In a few cases sight records have been accepted, a practice which perhaps calls for explanation. When, however, observations were made by reliable men at close range, it has seemed only reasonable to include them. Not

[1] Prepared as a part of a doctoral thesis at Cornell University.

everyone can carry a gun. In the end, the acceptance or rejection of these records is of small moment; it is the normal range which is significant.

On the basis of this study I should like to recommend the following revision of the winter range of the Tree Sparrow as given in the 1931 A.O.U. Check-List:

Spizella a. arborea.—Southern Minnesota, Ontario, New England, and Maritime Provinces, south to eastern Oklahoma, northern Arkansas, Kentucky, and Virginia. Rare or accidental south of those points.

Spizella a. ochracea.—East of the Cascade Range from southern British Columbia, western Montana, South Dakota, and southeastern Minnesota, south to Nevada, northern Arizona, New Mexico, and central Texas.

2. The Summer Range

In summer the Tree Sparrow retreats beyond the reaches of civilization and the records are consequently meager. J. A. Allen (1871) restricted the breeding range of this species to the Hudsonian Zone, that vast expanse of stunted spruces and scrubby willows and birches contained within the isothermal lines of 57 degrees and 50 degrees Fahrenheit. These lines were also used by Merriam on the U. S. Biological Survey Zone Map of North America (1910). The few nesting records that there are for the Tree Sparrow, however, fall only in approximately the northern half of the Hudsonian Zone. From personal observation in the vicinity of Churchill, Manitoba, and from numerous records along the coasts of Labrador and the Bering Sea, I conclude that they nest abundantly beyond the limit of trees, as far as there is any scrubby growth, thereby overlapping the range of such arctic species as the Lapland Longspur and Willow Ptarmigan. With the above facts in mind I have attempted to fill in, on the map, the gaps between specific records as accurately as possible for country so little explored.

There are no records, it will be observed, south of British Columbia, in which Province the species nest only above 3,500–4,000 feet (Swarth, 1926). Although writers have long felt that it should be found nesting in the Hudsonian belts of our western mountains, no one has as yet been able to find it there. Early accounts in Minnesota, Maine, Massachusetts, etc., have been either definitely disproved or rejected for lack of sufficient evidence.

B. The Subspecies

The question of subspecies is always a difficult one, due to the close similarity of the two forms and the large number of intermediates found throughout the middlewest. Recent re-examination of material from Minnesota, Iowa, and Missouri, by Dr. H. C. Oberholser, has led to the extension of the realm of *ochracea* almost to the Mississippi, while the eastern form, *arborea*, has been found as far west as western Nebraska and western Kansas.

Legend
Regular range and abundance.
Zone common to e. and w. subspecies.
Migrant only.
Numbers refer to specific records in author's files.

Winter Range of Spizella arborea

During the breeding season, when the plumage is badly worn, it is even more difficult to make a distinction between the two forms, and the paucity of specimens has made it almost impossible to determine the boundaries. Preble's work (1908) in the Mackenzie, Slave Lake and Bear Lake regions has been particularly valuable here, indicating a distinct westward trend during the spring migration, the outlines of which, however, must remain chiefly guesswork until more extensive collections have been made.

C. Statement of Range by States and Provinces

While the foregoing concise account of the range of the Tree Sparrow is probably sufficient for general purposes, the following analysis by States and Provinces may be of interest to those who care for greater detail.

Where no authority is cited the remarks on the status and abundance represent a summarization of the literature for the State. Migration dates are given whenever available. Unless otherwise stated the form referred to is the eastern subspecies, *arborea*.

Specific stations in border States, indicated by small figures on the maps, were too numerous to include in this paper, but will gladly be supplied to anyone interested who will address the author.

1. The Winter Range

Alabama.—Accidental. Howell (1928) says: "E. W. Graves reported it as common on Sand Mt., now believes it a misidentification." The *Bird-Lore* Christmas Census for 1915 includes a report of seven Tree Sparrows seen at Anniston on December 24, by Mr. R. H. Dean, in charge of the Weather Bureau at that point, and who claims familiarity with the species at La Crosse, Wis. In correspondence he emphatically defends the authenticity of his sight record.

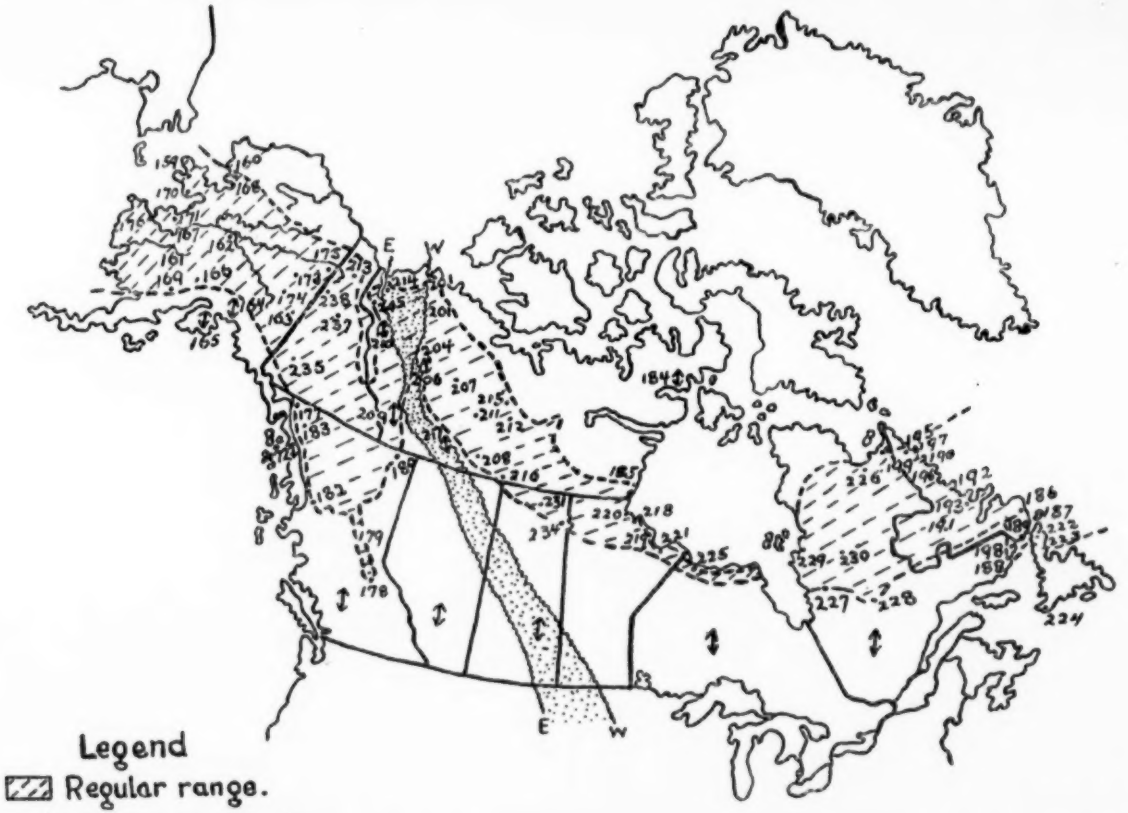
Alberta.—An abundant migrant in April and October, with only one winter record (Farley, 1932). Probably *ochracea*.

Arizona.—Rare. Swarth (1914) cites only two records (by Kennerly and Bendire), one near Tucson which is seriously doubted by present day field men in the region. A few records have been made since, indicating scanty but regular occurrence in northern parts of the State at higher altitudes. The form is *ochracea*.

Arkansas.—Rare throughout the State, with regular occurrence in northwestern part. Average migration dates based on four years' records by Baerg (1930): November 1 (October 18) to March 27 (April 3). In the eastern part they are found only around Helena (Pindar, 1924).

British Columbia.—Chiefly migrant, though both winter and breeding records are at hand. The form is *ochracea*, with "General distribution in valleys of mainland, except perhaps on more northern coast" (Brooks and Swarth, 1925).

California.—"Presumably an occasional midwinter visitant to the



Breeding Range of Spizella arborea

elevated northeastern section of the state, subject to severe winters" (Grinnell, 1915). The form is *ochracea*.

COLORADO.—One of the most common winter residents in the plains and valleys, from mid October (late September) to March and April (May 1) (Cooke, 1897). The vertical range has been given by Drew (1885), as follows: Common in winter up to 7,000 feet; in spring, up to 9,500 feet; none in summer. Bergtold (*in litt.*) felt that it was the most abundant winter bird in the State up to 9,000 feet, but that the distribution depended upon the amount of bare ground and weed patches regardless of altitudes. Sclater (1912) found it less abundant in the southwestern part of the State, but far from rare. The form is *ochracea*.

CONNECTICUT.—A very abundant migrant, chiefly in November and March; less abundant, though common, winter resident throughout the State (G. M. Allen, 1909). Migration dates are: October 20–30 (October 10) to April 12–25 (Sage, et alia, 1913).

DELAWARE.—Abundant winter resident, consistently reported in the *Bird-Lore* Christmas Census.

DISTRICT OF COLUMBIA.—Abundant winter resident, though sometimes rare. M. T. Cooke (1921) and Simpson (1917) give the following migration dates: November 8 (October 3) to March 27 (May 11).

GEORGIA.—One authentic record, probably accidental, of three individuals seen on February 25, 1921 (Bagg, 1922).

IDAHO.—Rare, with scattered records in the southern part of the State. H. F. Rust (*in litt.*) has only one sight record in twenty-five years of field work, and knows of only three specimens from the Panhandle region. R. L. Hand (*in litt.*) states that he has never seen the species in thirteen years. The form is *ochracea*.

ILLINOIS.—Abundant throughout the State. Most common from October 15 to April 1 (Ridgway, 1889); latest record on May 14 (Nehrling, 1896). The Forbes and Gross (1925) survey shows the relative abundance of Tree Sparrows in the different parts of the State, as compared with Juncos, thus:

Southern part: 24 per square mile; Junco, 187 per square mile.

Central part: 27 per square mile; Junco, 34 per square mile.

Northern part: 38 per square mile; Junco, negligible number.

INDIANA.—Abundant throughout the State (Butler, 1898); October 14 to April 10 (Fleetwood, 1933); extreme records, October 8 (Baumgartner, 1931) and April 19 (McAtee, 1905).

IOWA.—Both subspecies common throughout the State; of specimens examined by Oberholser twenty-three proved to be *arborea*, and twelve were *ochracea* (DuMont, 1934). Beal (1925) considered Iowa to be the center of abundance in the winter season. Less abundant in mid-winter in northern part of State (Anderson, 1907). Extreme records, September 20 (Spiker, 1924) and May 6 (Spurrell, 1921).

KANSAS.—Abundant winter resident, including both subspecies and many integrades (Bunker, *in litt.*). The subspecies *arborea* is abundant in the eastern part and rare in the western part; *ochracea* is abundant in the western and central parts, and rare or casual eastwardly. End of October, to middle of April (Linsdale and Hall, 1927).

KENTUCKY.—Common in the northern part, and uncommon or rare in the southern part. October 12 to March 21 (Blincoe, 1925).

MAINE.—A common migrant, with a few wintering regularly in the southern part of the State (G. M. Allen, 1909). O. W. Knight (1908) gives county records on which the map is based, and also migration dates, as follows: Spring, March 20 to April 5 (May 16); Fall, early September (September 4), but mostly in October.

MANITOBA.—Abundant migrant, with no winter records; breeds in northern part. The following migration dates for the southern part of Manitoba are from Criddle (1922), based upon twenty-five years of observation: Spring, March 24 (March 12) to April 6 (May 15); Fall, September 26 (September 9) to November 6 (November 15).

MARYLAND.—Abundant throughout the State. November 16 to April 12 (Eifrig, 1904).

MASSACHUSETTS.—A common migrant and less common winter resident (Forbush, 1929). October (September 9) to late April (May 28) (Allen, 1909). Greatest abundance, October 25 to November 25 and March 20 to April 20 (Chapman, 1901).

MICHIGAN.—An abundant migrant, and regularly a common winter resident in the southern part of the State (Barrows, 1912). The following migration dates based on averages of fifty years' records are given by Wood and Tinker (1934): October 19 (September 20) to April 16 (May 5).

MINNESOTA.—An abundant migrant, and regular though not abundant winter resident in the southern part of the State, reaching its northern limit in Isanti County (Roberts, 1932). Formerly it was believed that the subspecies in this State was *arborea* only. Recently thirty specimens were sent to H. C. Oberholser, and were found to be both *arborea* and *ochracea* in about equal numbers (T. S. Roberts, *in litt.*). Migration dates: Earliest, September 16; latest, May 15; immense numbers in October and early November, and in late March and early April (Roberts, 1932).

MISSOURI.—An abundant winter resident throughout the State. Nehrling (1896) says of it: "More abundant than anywhere else in the United States, especially in severe weather." The dominant form is *arborea,* but *ochracea* has been found to occur along the western border of the State, probably commonly (R. Bennitt, *in litt.*). Migration dates for Columbia: Arrive regularly during the third week in October, and leave about the last week in March, though a few stragglers remain until April; extreme dates, October 14 and April 15 (*ibid.*).

MONTANA.—"An abundant migrant and common winter visitor in valleys and on prairies throughout the state. . . . Occurs in the grasslands or brush areas in the mountains in migrations, but not in winter" (Saunders, 1921). From the reports of Cameron (1908), Silloway (1903) and Weydemeyer (*in litt.*), it appears that the Tree Sparrow is found more or less uncommonly in midwinter in the western part of the State, but only as a migrant in the eastern part. The form is *ochracea*.

NEBRASKA.—Abundant as a winter resident. Both subspecies occur, *arborea* chiefly in the east, and *ochracea* over the entire State, with some intermingling of the forms. According to Bruner, Wolcott, and Swenk (1904) the birds appear during the first week of October and remain well into April.

NEVADA.—Only seven definite stations have been reported, but Ridgway (1877) has described the Tree Sparrow as "generally distributed through valleys of the western depression of the Great Basin." Linsdale (1936) feels that they are "probably of more regular occurrence than the few records indicate." The form is *ochracea*.

NEW BRUNSWICK.—A regular winter resident, irregularly common (Chamberlain, 1882). Moore (1904) says: "Most common along river valleys, two or three together."

NEW HAMPSHIRE.—A common migrant and uncommon winter resident in southern portion; in winter as far north as White Mt. valleys (G. M. Allen, 1909). Late October and November (October 8) to April 24 (G. M. Allen, 1903).

NEW JERSEY.—An abundant winter resident throughout the State. Mid-October and November to April 26 (May 8) (Clausen, 1929).

NEW MEXICO.—Not abundant but of regular occurrence over most of the State. "One of the latest migrants, rarely before middle of November, north in March" (Bailey, 1928). The form is *ochracea*.

NEW YORK.—An abundant migrant and common winter resident, becoming increasingly abundant southward. Absent in winter in Adirondack region. Migrations occur chiefly in late March and first three weeks of April, from the end of October through November. County records on which the map is based are from Eaton (1910).

NORTH CAROLINA.—Straggler, only five sight records for the State; should perhaps be removed to the hypothetical list.

NORTH DAKOTA.—An abundant migrant, with only one winter record. Coues (1878) feels that it is probably more abundant than is realized, since it retires to the deep shrubbery in severe weather. The form is chiefly *ochracea*. The migration dates are: September 30 (September 21) to October 17 (November 16), and March 20 (February 27) to April 24 (May 6).

NOVA SCOTIA.—Listed as a fairly common winter resident by Downs (1866), and Macoun (1909).

OHIO.—"Abundant and generally distributed in winter" (Hicks,

1932). The migration dates are: Second week of October (first week) to mid-April (May 23) (Jones, 1903).

OKLAHOMA.—A winter resident of varying abundance, more common in severe weather (Nice, 1931). The subspecies *arborea* is found in the eastern and central parts, while *ochracea* occurs in the western part.

ONTARIO.—An abundant migrant, regular but not abundant as a winter resident in the southern part. Early October to late April (McIlwraith, 1894).

OREGON.—Never abundant; chiefly migrant, but a more or less regular winter resident east of the Cascades (Gabrielson, *in litt.*). The form is *ochracea.*

PENNSYLVANIA.—An abundant winter resident throughout the State. Migration dates listed by the Delaware Valley Ornithological Club (1932) for 1928–1929 are: mid-November (September 18) to mid-April (May 8).

PRINCE EDWARD ISLAND.—An abundant migrant, with a few winter residents (Bain, 1885). No specific records are given.

QUEBEC.—Migrant only. Macoun (1909) calls it a winter resident, but gives no explicit records. The migration periods at Montreal are: October 25 to November 7 and April 7 to April 28 (Macoun, 1909).

RHODE ISLAND.—An abundant migrant and less common winter resident (Forbush, 1929). Howe and Sturtevant (1899) record it from November 14 to April 11.

SASKATCHEWAN.—An abundant migrant. One winter record in the Frenchman Valley (Potter, 1929). The subspecies is probably *ochracea* (Taverner, *in litt.*).

SOUTH CAROLINA.—Accepted since the days of Audubon and Coues as the southern limit of the range without explicit records. Wayne (1910) and Sprunt (1932) refute the occurrence of the Tree Sparrow in South Carolina, as neither they nor other recent observers have even seen one in any part of the State.

SOUTH DAKOTA.—An abundant migrant and the most abundant winter resident in the southern part of the State. Both subspecies occur. Early October to May (Agersborg, 1885). Most abundant in November and April (Visher, 1913).

TENNESSEE.—"Very rare winter visitant" (Ganier, 1933). Rhoads (1896) refers to a specimen in a collection of a Tennessee man, but without locality data. A sight record is given by Johnson *et al. in* the *Bird-Lore* Christmas Census for 1929.

TEXAS.—Commonly recorded in small flocks in the northern part of the State in winter. The subspecies is *ochracea.*

UTAH.—A fairly common winter resident in the valleys of northern and central Utah, and occurs sparingly in suitable situations throughout the State. At Provo from October 20 to April 1 (Cottam, *in litt.*). "Common winter resident to the Great Basin" (Ridgway, 1877). The subspecies is *ochracea.*

VERMONT.—A common migrant and common winter resident in southern and lower lands; October to April (G. M. Allen, 1909).

VIRGINIA.—Not abundant, but a regular winter resident, uncommon southward; consistently reported in the *Bird-Lore* Census from the northern part of the State.

WASHINGTON.—An uncommon migrant and winter resident in the eastern part of the State; has never been taken west of the Cascades (Dawson and Bowles, 1909). The form is *ochracea*.

WEST VIRGINIA.—A common winter resident throughout the State. (Doan, 1888).

WISCONSIN.—An abundant migrant, and common winter resident in the southern part of the State, October and November to March and April (Kumlien and Hollister, 1903).

WYOMING.—Common; most numerous in spring and fall (W. C. Knight, 1902). Is seen in flocks of ten to twenty-five as a winter resident at lower elevations—below 7,000 feet (McCreary, *in litt.*). The migration dates at Laramie (average of eight years) are: October 17 to November 10 and March 11 to April 7 (*ibid.*). The form is *ochracea*.

2. THE BREEDING RANGE

ALASKA.—*Spizella arborea ochracea* is well distributed over central Alaska, as far south as the Alaska Range, east of Bering Sea tundra (Dice, 1920); it is especially numerous along the coast of Bering Sea and all along the Yukon (Nelson, 1887). Records are less common north of the Arctic Circle. The birds arrive about May 1 in western and central regions, nests being found from the coast level up to 1,500 feet (Twitchell, *in litt.*).

ALBERTA.—Both subspecies occur as migrants. Dr. Francis Harper tells me that he believes both subspecies (or intermediates) migrate through the Athabasca region in the fall, but only the eastern form in the spring. The subspecies *arborea* was believed by MacFarlane (1908) to breed at Fort Chippewyan but the record is below the limits set in an extensive survey of the region by Harper (1931).

ANTICOSTI ISLANDS.—It is still unsettled whether the Tree Sparrow breeds here, though it may to some extent (Lewis, 1924).

BRITISH COLUMBIA.—*Spizella arborea ochracea* is a fairly common summer resident at high elevations in the interior (Brooks and Swarth, 1925). Anderson (1915) sets the altitude at 3,000–4,000 feet.

KEEWATIN.—Found abundantly on the coast in extreme southern part (Preble, 1902). Probably breeds throughout the interior in the Hudsonian Zone, though there are no explicit records on which to base the exact limits.

LABRADOR.—"Common in Hudsonian forests as far north as there is any scrubby growth; seldom found in barren coastal zone, in tundra

district of northern third of district, or in Canadian forests to the south . . . Center of abundance in middle third of the northeastern coast, from Port Manvers to Hamilton Inlet, south of that in a narrow strip where there is scrub country between the barren coast and wooded interior" (Austin, 1932). Last seen on the southern coast on October 12; arrives May 15 (Cooke, 1916).

MACKENZIE.—Abundant wherever scrub occurs north to the Barrens (Blanchet, 1925). Both subspecies are found, *ochracea* being the predominant one from Anderson Valley westward (Preble, 1908).

MANITOBA.—Breeds abundantly in extreme northern part, in Hudsonian Zone and as far as there is any scrubby growth (Preble, 1902). Found nesting abundantly in the timber and open river flats among thickets of birch and willow in vicinity of Churchill, at Seal River, thirty miles north of Churchill, but not found on barren Cape Churchill, thirty miles east of Churchill (personal observation).

NEWFOUNDLAND.—Rare breeder in higher hills, where it was recorded by Palmer (1890) and Arnold (1912).

NEW BRUNSWICK and NOVA SCOTIA.—None in the summer (Baird, Brewer, and Ridgway, 1905).

ONTARIO.—An abundant migrant, winter resident in southern part, breeding in extreme northern part.

QUEBEC.—Migrant in southern part, breeding abundantly north of latitude 53 degrees (Macoun, 1909).

SASKATCHEWAN.—Abundant breeding records from extreme northern parts—probably *ochracea*. On the basis of the species' requirements elsewhere, I am inclined to doubt Coubeaux's statement (1900) that it is an "abundant summer resident throughout the country" as far south as 50 degrees to 53 degrees north latitude.

YUKON.—Probably breeds abundantly, but there are very few explicit records. The form is *ochracea*.

UNITED STATES.—There are various reports by early writers of the breeding of the Tree Sparrow in Minnesota, Maine, Massachusetts, etc. These records are now either disproved or rejected for lack of sufficient evidence. Some authors still feel that there is a possibility of its breeding in high mountains near timber line, but as yet there is no proof. There is one report of the finding of a nest with eggs at Meridian, N. Y., by E. G. Tabor (1889), the female also being collected as she left the nest. While it seems improbable that a careful observer should misidentify a bird which he has in hand, yet it is also unbelievable that this boreal species should nest so far out of its range. Moreover, the description of the nest and eggs does not tally with any that I have seen or read of. For example, there was no feather lining to the nest; and the eggs showed "several short scratches of seal brown similar to the scratchy lines on a Baltimore Oriole" egg. Mr. Tabor does not state where the skin or nest were deposited and they cannot now be traced.

SUMMARY

From a study of available records and personal investigation the following conclusions have been drawn:

1. The normal winter range of the eastern subspecies does not extend as far south as stated in the A.O.U. Check-List (Fourth Edition, 1931), reaching its southern limit, except for rare and accidental records, in Virginia, central Kentucky, and northern Arkansas.

2. The western form in winter is found between the Cascade Range and the Mississippi River, with all shades of intergradation of the two subspecies found in the States just west of that river.

3. In summer both forms extend far west of the winter range, *ochracea* inhabiting Alaska, British Columbia, and the Yukon region, while *arborea* ranges from the Anderson River eastward to Labrador.

4. The breeding range extends northward beyond timber line to the limit of scrubby growth, southward only to the northern third of the Hudsonian Zone as outlined by Merriam's map. No records south of the mountains of British Columbia have been substantiated.

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STILLWATER, OKLAHOMA

FOOD AND HABITS OF SOME BIRDS NESTING ON ISLANDS IN GREAT SALT LAKE

BY CLARENCE COTTAM AND C. S. WILLIAMS

WHITE Pelicans, Double-crested Cormorants, California Gulls, and Great Blue Herons[1] have nested commonly during recent years on a number of islands in Great Salt Lake. On July 11 and 12, 1938, Irvin Rasmussen of the U. S. Biological Survey, Lee Kay of the Utah State Fish and Game Commission, and the writers visited Hat and Gunnison Islands, the most important nesting grounds in the lake, made observations and banded a number of fledglings.

Hat Island is about 35 to 50 miles southwest of the extensive Bear River Marshes, which serve as a feeding place for many of the nesting birds. Locally it is known as "Bird" Island, and is a small, roughly circular piece of land some 175 yards in diameter, with a sand bar projecting from the south side. At the present time this bar extends about a mile, but from 1901 to 1905 and from 1931 to 1937 it connected Hat Island with Carrington Island some 5 miles distant. The island for several yards back from the water is relatively flat, and then the ground rises gradually to a rugged, rocky summit some 75 or 80 feet above the water level.

Gunnison Island is approximately 30 miles northwest of Hat Island (65 miles northwest of Saltair), 12 miles north of the Lucin Cut-off, and 45 miles by airline west by southwest of the headquarters of the Bear River Migratory Bird Refuge. This important nesting ground is much larger than Hat Island and has fully 3 miles of shore line; also, despite its more extensive flats and gently rising slopes, the rocky crest, which rises some 150 feet above the water line, is more rugged.

Both islands have a fair covering of typical salt desert shrubs and herbs, among which the greasewood bushes (*Sarcobatus vermiculatus*) predominate. Some *Sueda* sp., *Dondia* sp., *Bromus tectorum, Distichlis spicata, Atriplex confertifolia,* and *Artemisia tridentata* also occur.

A number of writers have described the nesting bird colonies on the islands of Great Salt Lake (see especially Behle (1935), Palmer (1916), Ridgway (1877), Stansbury (1852), and Woodbury and Behle (1933)). At the late date (July 11) on which we visited the islands, nesting was well advanced or nearly completed. No cormorants were noted, but it is possible that the young produced had already attained their growth and migrated to the mainland. We thought this was the case, as cormorants frequently nest very early in the spring. Many young gulls were flying, and it is probable that many of these birds also followed their elders to the mainland where food was more plentiful. Pelicans and gulls were practically through incubating on Hat Island and only three of the late-incubating pelicans remained on Gunnison

[1] *Pelecanus erythrorhynchos, Phalacrocorax auritus, Larus californicus,* and *Ardea herodias* respectively.

Island; however, a fair number of gulls still unable to fly were observed. All these had left the nest, and at our approach the older ones scuttled toward the water and the young ones sought safe hiding places among the rocks and weeds. As stated previously, many of the young gulls were on the wing; consequently, an accurate estimate of the population was impossible.

On Hat Island we saw about 425 young pelicans and possibly 3,000 young California Gulls, and on the larger Gunnison Island approximately 1,600 pelican nests and 1,800 of the young birds. On the latter island we observed only 13 juvenile Great Blue Herons, most of them still unskilled in the art of flying, although we found a dozen nests, some of which were deserted.

Pelicans seem to be highly communal, for we noticed that those hatching young at about the same time nested in compact units. Consequently, the young were segregated into social units (pods) according to size, in groups varying from 15 to more than 100 birds. From evidence gleaned at the nests and elsewhere on the islands it appeared that some of the nesting birds and their young had left for the Bear River Marshes, Locomotive Springs, or elsewhere on the mainland, where the food supply was more accessible and dependable.

The reactions of the various species to our attempts at catching the young flightless birds were interesting and noticeably different. The young herons and gulls promptly scattered, the latter species making desperate efforts to reach the water, though remaining more or less in their age classes, or units. Parent gulls were especially solicitous of the young fledglings, and when our party pursued these young, the adults set up a harsh and deafening babble of discordant alarm calls, at the same time circling low over our heads and making aerial dives, occasionally coming uncomfortably close. The parent birds showed the greatest concern for the youngest and most dependent in their broods. This parental instinct to protect the young seemed to be largely wanting in both the pelicans and the herons. When we approached, the young herons showed not the slightest tendency toward grouping as each bird made a frantic and hasty retreat in whatever direction suited his fancy.

The response of the young pelicans to disturbance was quite different from that of the young of other species. Birds of an age class remained together in their pods, closely following a leader, much like a flock of sheep. When we approached, the parents of the older juveniles merely left the scene of danger and flew some distance out in the lake to rest. The parents of the more helpless young appeared to be more solicitous and seemed to realize that long exposure to the extreme heat of the summer's sun would endanger their progeny. These birds were more reluctant to leave their young, and at our approach they laboriously, but mutely, flew off and circled high over the island, apparently hoping to return to their young at the moment danger was over.

The food habits of these nesting, fish-eating birds present a problem of more than ordinary interest because of the great distance between the islands and a possible source of food. It is generally known that fish-eating birds have very rapid digestion. In making stomach analyses it is a common experience to find the anterior part of a fish that has passed through the proventriculus and into the gizzard practically digested, while the median and caudal parts are relatively fresh and unaffected. Feeding observations and experiments indicate that digestion in many of the fish-eating birds may be well-advanced, if not entirely completed, within an hour.

The experienced food analyst obtains many evidences that various bird species have a mechanism for controlling the digestive organs and possibly also the rate of digestion. Kaupp (1924) and others have shown that domestic fowls can retain relatively large quantities of gravel in their gizzards for more than a year. Migratory birds are occasionally taken with food particles in their gizzards far removed from their possible source of occurrence. McAtee (1938) appropriately suggests that gallinaceous birds at least may possibly control what food goes first into the crop and what goes directly into the gizzard. He further adds: "Gizzards are known to have differential powers of retention with respect to grit and there may be phenomena with respect to the flow of food from crop to gizzard with which we are not acquainted." It seems probable that fish-eating birds and others have the power to contract the base of the gullet leading into the cardiac unit of the stomach and prevent digestive fluids from coming in contact with the food.

The Bear River Marshes, Locomotive Springs, and other parts of the mainland where fish might be obtained are more than 30 miles distant. In years past when Utah Lake offered an abundant supply of fish, it was a common sight to see flocks of pelicans in transit to and from Utah Lake, a distance of 75 to 100 miles.

That gulls and pelicans have some control over their digestive processes is indicated by the fact that many of the young birds, recently fed by their parents, regurgitated quantities of practically undigested food when pursued by our party. One young gull regurgitated 62 whole grasshoppers (mostly *Melanoplus* sp.), that showed scarcely any signs that digestion had even started. Other gulls expelled a variety of whole insects, including grasshoppers, beetles, and true bugs. One bird disgorged several whole cherries along with other cherry-fruit partly digested or slightly macerated. Still other young regurgitated small, whole carp, catfish, and minnows, and others a wide variety of garbage including large chunks of cube steak, fried potatoes, cooked beans, and, in one instance, even a standard cloth packet (cup size) of green tea, obviously obtained in the vicinity of one of the mainland towns. Among

both gulls and pelicans, it was noted that even the younger and more helpless juveniles were usually fed whole and undigested food.

That the California Gull is both a scavenger and an omnivorous feeder is well known. Laboratory examination of 6 well-filled stomachs of birds taken on the mainland in the vicinity of Utah's great inland sea gave the following results: Insects, 63.17 per cent (segregated as follows: flies—mostly larvae and pupae of salt flies (*Ephydra* sp.), 46.5 per cent; beetles—mostly ground beetles (Carabidae), 15 per cent; cutworms (Noctuidae), 1 per cent; grasshoppers and hymenopterons, 0.67 per cent); angleworms (Lumbricidae), 15.83 per cent; carrion, 8.33 per cent; miscellaneous vegetable debris, 8.33 per cent; fish, including carp and minnows, 4.17 per cent; and undetermined bone fragment, 0.17 per cent.

The stomachs of 4 White Pelicans taken on the Bear River Refuge showed that the birds had fed exclusively upon minnows (*Leuciscus* sp.) and carp (*Cyprinus carpio*). On the islands of Great Salt Lake numerous young pelicans were seen to regurgitate. All of them had likewise fed exclusively on fish, mostly minnows, carp, and catfish. The uninitiated bird bander who captures these rebellious young, should do so before, rather than immediately after, a meal. When the flightless young are first cornered they make frantic, though awkward and amusing, efforts to escape. When they find themselves captured, their next response is one of fight, a defense in which they show surprising skill. If the assailant is so unfortunate as to find himself holding the struggling legs or wings of 8 or 10 of these nearly mature birds at once, he is sure to obtain memories that will last. The bruises and scratches are minor in comparison with the experience of being given an interior view of a truly gullible young attempting to swallow the head of the intruder. When efforts to escape prove unfruitful, the bird's next procedure is to disgorge its last meal.

It is perhaps not well known that Great Blue Herons, particularly in the West, feed extensively on rodents captured in fields and pastures, and cast up the indigestible remains as pellets, often of unusually large size. On July 12 the writers obtained pellet remains at the nests of several birds on Gunnison Island in Great Salt Lake. The foods recorded from about 10 pellets were as follows: Remains of several ground squirrels (*Citellus townsendi mollis*), 76 per cent; field mice (*Microtinae*), 21 per cent; remains of an undetermined bird, trace; carp (*Cyprinus carpio*), 1 per cent; miscellaneous insect fragments of many species, including grasshoppers, crickets, aquatic beetles, aquatic bugs, and ants, 1 per cent; and plant fiber, including both vegetative material and seeds mostly of aquatic and marsh species, pondweeds, sedges, and grasses, 1 per cent. It is possible, and perhaps probable, that some of the rodents were obtained on Gunnison Island; other food items, however, may have been procured on the mainland 30 or 40 miles away.

That the nesting bird is not averse to eating the young of other birds is shown by the contents of 46 Great Blue Heron pellets obtained at one nest on the Bear River Refuge in 1915. From these 46 pellets 40 young Coots (*Fulica americana*), 5 Avocets (*Recurvirostra americana*), and 4 Black-necked Stilts (*Himantopus mexicanus*), as well as 1 young muskrat (*Ondatra zibethica osoyoosensis*), were recorded.

Examination of 6 stomachs of Great Blue Herons taken at the Bear River Marshes showed that the food consisted mostly (75.83 per cent) of fish. The foods recorded were as follows: Suckers (Catostomidae), 33.33 per cent; minnows (Cyprinidae), 25.83 per cent; carp (*Cyprinus carpio*), 16.67 per cent; diving beetles (*Hydrophilus* sp. and *Dytiscus* sp.), 1.67 per cent; and plant fiber, mostly (*Potamogeton pectinatus* and *Scirpus* sp.), 22.50 per cent.

We also feel that the concentration of herons on the Bear River Refuge may in part be responsible for the paucity of snakes of any sort on the refuge proper. This may prove to be decidedly beneficial to the waterfowl of the area, as in some other localities the larger snakes account for considerable losses among both ducklings and duck eggs.

Besides the data on the fish-eating birds, we obtained and examined 2 huge pellets of the Golden Eagle (*Aquila chrysaetos*). These were found to consist almost entirely of fragments of fur and bones of muskrats. In addition to the muskrat remains, one pellet also contained traces of several aquatic beetles. One pellet measuring 6½ inches long and 2 inches in diameter weighed 53.05 grams when thoroughly dried.

Summary

White Pelicans, Double-crested Cormorants, California Gulls, and Great Blue Herons have nested commonly during recent years on certain islands in Great Salt Lake. On July 11 and 12, 1938, a visit was made to the two most important, Gunnison and Hat Islands. Cormorants had all left the island by this time and nesting was well advanced for all the other species.

On Hat Island we saw about 425 young pelicans and possibly 3000 young California Gulls and on Gunnison Island there were approximately 1600 pelican nests and 1800 young birds and a proportionately larger number of gulls. There were also 13 young Great Blue Herons. Young pelicans were highly communal and were segregated into compact social units (pods) according to size and remained together under all conditions. Young herons showed not the slightest tendency toward grouping when effort was made to capture them.

The various species responded very differently to attempts at catching and banding their young. Parent gulls were most solicitous of their progeny, while pelicans and herons showed little or no concern.

While fish-eating birds normally have rapid digestion, their nesting

on islands 30 to 100 miles removed from their source of food supply suggests that they may have some mechanism for controlling the digestive organs and possibly also the rate of digestion. Young birds of Gunnison and Hat Islands that had just been fed by their parents were seen to regurgitate quantities of practically undigested food. The gulls seemed to be both scavengers and omnivorous feeders and disgorged undigested grasshoppers, garbage and fish, while pelicans seemed to be subsisting entirely upon non-game fish.

Pellets and stomachs of herons showed that these birds had fed on ground squirrels, field mice, fish, young birds, insects, and plant fiber, while two large Golden Eagle pellets showed only the remains of muskrat.

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A RACE OF YELLOW-BREASTED CHAT FROM THE TROPICAL ZONE OF SOUTHERN SONORA

BY A. J. VAN ROSSEM

YELLOW-BREASTED CHATS from the Tropical Zone of Sonora, south of the established breeding range of the species in Lower California, Arizona, and northern Sonora have been difficult to obtain, and during the past nine years I have been able to find only 9 which are either certainly or very probably breeding birds. All were taken in the months of June and July, six of them in the Mayo River Valley, one at Agiabampo on the Sonora-Sinaloa boundary and two from Pilares in the Bavispe River Valley. They are in the L. B. Bishop, Dickey, Hachisuka, University of Michigan, and W. J. Sheffler collections. These have been compared with series of the Long-tailed Chat from many localities which range from Coahuila on the east, west to California, Oregon, Washington, Lower California, Idaho, Arizona, and northern Sonora, and there is obvious reason to name the Tropical Zone breeding race. This may be known as

Icteria virens tropicalis subsp. nov.

TYPE.—Breeding male adult, 31942 Dickey collection; Tesia, Sonora, Mexico, June 19, 1937; collected by A. J. van Rossem.

SUBSPECIFIC CHARACTERS.—Resembling *Icteria virens auricollis* (Lichtenstein) of the Mexican Plateau and western North America but size smaller; tail approximately equal to wing instead of longer; dorsal coloration, particularly on rump, upper tail coverts, and wing margins, grayer and more ashy (less greenish); ear coverts blacker. Nine adult males of *tropicalis* measure: wing, 72-77 (75.0)mm.; tail, 70-79 (74.8)mm.

RANGE.—The Arid Tropical Zone of southern Sonora, north in the Bavispe River Valley to about 30° 30′ N. Winter range unknown.

REMARKS.—In the various series examined there are some readily apparent geographic tendencies which, eventually, it may be desirable to recognize by name. Specimens from the region from Coahuila westward to southern Arizona, and northern Sonora (south to Guaymas) are characterized by a slightly greener dorsal coloration, decidedly more grayish flanks and brighter, more golden yellow anterior underparts. It is with this type that Lichtenstein's three (apparently breeding) Mexico City co-types in the Berlin Museum belong. Pacific coast specimens from Lower California northward, and eastward at least to Idaho in the interior, are grayer dorsally, are duller and darker yellow below, and have distinctly darker and browner flanks. Should it prove desirable to allow this distinct tendency a name there is available, of course, Lawrence's *longicauda*.

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A DETAILED STUDY OF A FAMILY OF ROBINS

BY WILLIAM EDWARD SCHANTZ

DURING 1935 two nests of a pair of Robins (*Turdus migratorius*) were ideally located for observation on the porch of our home in Columbus, Ohio. Electrical apparatus was used to announce and record the arrivals at the two nests so that it was impossible for the adults to come to the nest without ringing an electric bell or making a recording on paper tape. The controlling switches were installed the second and first night respectively after the first and second nests were started. I usually spent from one to 16 hours each day in direct observation, my family assisting me greatly in this study by their thoughtful cooperation and indulgence. The third and last nest was built in a nearby apple tree where observation was difficult. The abnormally warm weather of March apparently hastened the beginning of the breeding season from one to two weeks. The mean temperature for the month was 47.8°F. compared with 39.0°F. normal (i.e. the mean from 1880 to 1935 at Columbus, Ohio).

We distinguished our pair of adult Robins from the others of the immediate neighborhood by coloration of plumage and more or less by personality. The female had two white tertiaries in her right wing; the male had brighter breast plumage and noticeably more white above his eyes than another male who occasionally used the same territory. Aluminum bands were applied to the nestlings of the first brood when they were about 11 days old so they might be identified away from the nest. Dye was applied to each nestling of the second brood as it hatched and on the sixth day aluminum bands were attached. The third brood was not marked for identification, but two of the fledglings associated closely with the adults for 11 days.

SUMMARY OF THE THREE BROODS

First egg	Number laid	Hatched	Young left nest		Number reared to independence
			Date	No.	
March 30	3	Apr. 13–14	Apr. 29	3	1
May 7	4	May 21–22	June 4–5	4	2
June 9	3	(June 23)	July 7	3	2

NEST BUILDING

Female first visits porch. Around midnight, March 19, a female Robin, after apparently being routed from sleep, was attracted to the porch by the electric light. She finally settled down there for the remainder of the night and returned there the next evening.

Nest Construction. Early in the morning, March 21, she began to carry nesting material to the inner top ledges of the three porch columns but soon favored the eastern one. She ceased work by noon the first day; worked slowly all of the second and third days; started lining the

nest the fourth, ceasing work before noon; she completed the nest the fifth day, March 25, by adding three bunches of dead grass.

On May 1, two days after the first brood was fledged, she selected a similar location on the other end of the porch for the second nest. It required less construction time to build, even though she was helping care for the fledglings at the time. Less fibrous foundation material was used than in the first nest. She worked a short time the morning of the first day; slowly all of the second and third; and completed it by noon of the fourth day, May 4. She became soiled on the crissum, chin, and throat while adding mud to the nests.

The Male's Interest in the Nests

The male did not aid in nest construction nor accompany the female as she worked. He only visited the first nest once before it was completed but seemed much interested the few minutes he perched close beside the female as she worked. He visited it again two days after it was completed. He awkwardly tucked at the nesting material and vigorously shuffled around counter-clockwise with tail and bill down over the rim.

On March 31 and April 3, during deep twilight, he again visited the nest. He seemed relieved afterwards for he no longer complained. He did not visit the nest again until the eggs began to hatch. The day after the first brood was fledged, the male frequently visited the elbow of a nearby drain pipe where he moved about much in the same manner as he had in the cavity of the first nest. He continued this make-believe at intervals until he visited the second nest, the day after it was completed. He came to the nest twice that day, at 7:10 and 7:36 A.M. Each time he secured a long coarse stem from the top ledge of the center porch column and tried awkwardly to get it into the nest cavity. His movements at times resembled bathing, and the lining became frazzled at the rim.

Egg Laying

Interval between nest completion and the first egg. Five days elapsed before an egg was deposited in the first nest. The birds did not visit it the day following completion; both came once the second day; and the female visited it once in the early morning of the third and fourth days.

Three days elapsed before the first egg was deposited in the second nest. The male visited it twice the day after completion while the female lingered nearby; and neither came the second day.

Deposition of the eggs. The female seemed uneasy the morning that the first egg was deposited in the first nest. She first came to the nest at 7:55 A.M., then left the porch three times and the nest four other times. Her movements were nervous. She was absent from the nest

between 8:46 and 9:45 A.M. She then stayed quietly on the nest sixty-four minutes before the first egg was deposited at 10:58 A.M. She left the nest at once without looking at the egg and did not return until next day.

She was only slightly less nervous before the second egg was deposited between 2 and 2:15 P.M. the next day. The third and last egg was laid the following day.

She behaved similarly before depositing the first egg in the second nest between 9:55 and 10:10 A.M., May 7, but remained on the nest a few minutes afterwards. Three more eggs were deposited during the next three days.

INCUBATION

Incubation and hatching. Without exception, incubation began the evening after the second egg was deposited and lasted for about thirteen days. The female alone incubated. The male did not at any time cover the eggs or nestlings. He visited the nest at once just as soon as the eggs began to hatch. Both birds seemed very interested as they frequently peered low into the nest at that time and turned the eggs and new nestling.

The 4 eggs of the second brood were known to have hatched in the order deposited; the first and second a few hours apart, forenoon and afternoon respectively of May 21; the third at 10:41 P.M. the same day; and the fourth 1:20 P.M. the next day. (In two other Robins' nests, the second eggs hatched first.)

Distinct taps usually from 25 to 31 times per minute could be heard at intervals as the bird was breaking the shell to emerge.

The fourth bird required longer to emerge than the others, almost 18 hours from the time the shell began to crack.

Six minutes after emerging, the third bird first begged for food, but was not fed. Two hours and thirty-seven minutes later it was so hungry that it responded often and almost incessantly peeped.

Periods at and away from the nest during incubation. The male did not at any time offer the female food during incubation. She left the nest from 13 to 19 times each day or an average of 16.2 times for 6 days during the first incubation and from 10 to 18 times each day or an average of 16.3 times per day for 10 days during the second incubation. The third was not checked.

A close check was kept on the visits to the first two nests, but unfortunately I did not realize the value of securing information about the actual time of the periods off and on the nest each day. However, an analysis of 40 of these periods made by direct observation and taken at random during the second incubation after the first two days may be enlightening. This analysis shows that the female left the nest on the average of once every 44.15 minutes and was away 11.3 minutes.

This would imply her spending approximately 80 per cent of the daytime on the nest and 20 per cent away. The periods ranged from 23 to 74 minutes on the nest and from 2 to 22 minutes away. Table 1 shows the average, minimum, and maximum time, and the time of day of these 40 periods off and on the nest during the second incubation.

TABLE 1. LENGTH OF FORTY PERIODS ON AND OFF THE NEST DURING THE SECOND INCUBATION

Hours	On nest		Away from nest	
	Average	Min and Max.	Average	Min and Max.
5 to 8 A.M. ...	27 minutes	23–30	12.0 minutes	2–22
8 to 10 A.M. ..	53 minutes	47–70	6.2 minutes	4–8
10 to 12 M ...	47 minutes	37–67	7.5 minutes	5–9
12 to 6 P.M. ..	47 minutes	30–74	8.1 minutes	3–14
6 to 7 P.M. ...	32 minutes	28–36	10.3 minutes	6–13

The female spent a longer time away from the nest on her first absence the day after incubation began than on any of the other days. She was absent 97 and 120 (plus) minutes respectively the first mornings of the first two incubations as compared with 16 to 48 minutes on the later mornings (for 8 days). In Tables 2 and 3 are shown some of the hours that the female first left the nest for the day and the hours of first and last return with notes on weather for the first two nestings. These Tables also give the number of returns per day as recorded by the electrical apparatus, and many were verified by direct observation, for 17 days of the first nesting and for 24 days of the second nesting.

Table 4 gives the number of returns to the nest for each hour of the day for 21 days during the second nesting. If the birds returned at 4:03, 4:15 and 5:01 in the morning, this would be listed for that particular date as 2 returns for the hour of 4 A.M. and 1 return for the hour of 5 A.M. This Table was interesting to me because, like Table 1, it shows that the maximum number of trips per hour during the second incubation were in early morning and late evening.

Ability to see in the darkness. The female had difficulty in locating the nest in the darkness of early morning and late evening. At 8:08 P.M. May 26, the female missed the top of the center porch column, her usual first stop on the way to the nest, and collided with the wall which happened to guide her to the nest. She then called louder and louder trying to feed the nestling the small amount of food which she happened not to drop. The male arrived 3 minutes later and fed at once perfectly. The female then began to feel about with her bill and covered the nestlings without feeding them.

Such behavior was not unusual for her; and a few times after she had fluttered about awkwardly trying to get to the nest, the electric light was switched on and she responded at once.

The male did not have such difficulty. His ability to see in the darkness was better than mine.

TABLE 2. VISITS OF PARENTS TO NEST DURING FIRST NESTING

	Date	First left nest	Returned (A.M.)	Minutes away	Sunrise	Weather at sunrise	Weather at sunset	Sunset	Last return (P.M.)	Total returns for day
Incubation Period	Apr. 1	4:51	7:28	97	6:16	foggy				
	Apr. 2		6:49		6:14	cloudy				
	Apr. 3	5:46	6:34	48	6:12	clear				
	Apr. 4	5:28	6:16	48	6:11	clear				
	Apr. 5	5:36	6:14	38	6:09	cloudy				
	Apr. 6		6:12		6:08	cloudy	cloudy	7:01	6:58	17
	Apr. 7	5:40	5:56	16	6:06	cloudy	cloudy	7:02	6:44	19
	Apr. 8		5:59		6:05	cloudy	cloudy	7:03	6:07	16
	Apr. 9		5:30		6:03	cloudy	cloudy	7:04	7:07	13
	Apr. 10	5:27	6:00	33	6:02	cloudy	cloudy	7:05	6:31	13
	Apr. 11		6:07		6:00	cloudy				
	Apr. 12	6:02	6:28	26	5:58	cloudy				19
Hatching	Apr. 13	*	6:11*		5:57	cloudy				
	Apr. 14	*	6:29		5:55	clear	cloudy	7:09	7:10	30
Nestling Period	Apr. 15		5:52		5:54	cloudy				
	Apr. 16					freezing	cloudy	7:11	7:03	82
	Apr. 17	5:47	5:56	9	5:51	cloudy	cloudy	7:12	7:09	
	Apr. 18		5:45		5:50	cloudy	cloudy	7:13	7:22	83
	Apr. 19	5:36	5:49	13	5:48	cloudy	cloudy	7:14	7:28	89
	Apr. 20	5:30*	5:32	2	5:47	cloudy	cloudy	7:15	7:23	82
	Apr. 21	5:20			5:45	cloudy	clear	7:16	7:24	90
	Apr. 22	4:54*	5:04*	10	5:44	cloudy				90
	Apr. 23		5:31		5:42	cloudy	cloudy	7:18	7:29	84
	Apr. 24	5:18*	5:24†	6	5:41	cloudy	cloudy	7:19	7:40†	95
	Apr. 25		5:18		5:40	clear	cloudy	7:20	7:10‡	
	Apr. 27		5:18		5:37	clear				99
	Apr. 28		5:07		5:36	clear				98
	Apr. 29		5:10		5:34	cloudy				

* Twenty-five watt light on porch burning.
† So awkward in the darkness that porch light was switched on.
‡ Did not remain on nest tonight, fed and left.

CARE OF THE YOUNG

Feeding the newly hatched nestlings. During the early afternoon, April 13, one egg of the first nest hatched and the other two the following day. The male brought food twice in late afternoon and willingly gave it to the female who fed. He previously had visited the nest during her absence, peered low and then gently changed the position of the two eggs and little bird. The female returned to the nest without food.

The next day the male brought the first food at 7:48 A.M. and the female fed it to the young. He did not visit the nest between 12:08 and 5:48 P.M. but remained very close. During this time the female fed 6 times and returned twice without food. Her longest absence for this period was 29 minutes and the average 10 minutes. Twenty-one of the 30 trips for the day were carefully checked. The male came 5 times with food and the female 9 times. The male also came twice without food and the female 5 times. At times both had difficulty; they had to offer the food frequently as they called loudly and one time the adult had to give up and eat the food instead of feeding the young.

TABLE 3. VISITS OF PARENTS TO NEST DURING SECOND NESTING

	Date	First left nest	Returned (A.M.)	Minutes away	Weather Sunrise	Weather at sunrise	Weather at sunset	Sunset	Last return (P.M.)	Total returns for day
Incubation Period	May 9		8:09	120	5:22	cloudy	cloudy	7:34	7:51	10
	May 10	5:07	5:29	22	5:21	clear	clear	7:35	8:02†	18
	May 11		5:27		5:20	clear	cloudy	7:36	7:57	18
	May 14	*	5:22*		5:17	cloudy	cloudy	7:39	7:34	17
	May 15		5:14		5:16	clear	cloudy	7:40	7:18	15
	May 16		5:16		5:16	cloudy	cloudy	7:41	7:37	18
	May 17		5:07		5:15	cloudy	clear	7:42	7:08	17
	May 18		5:15		5:14	clear	clear	7:43	7:40	17
	May 19	5:36	5:45	9	5:13	cloudy	cloudy	7:44	7:31	16
	May 20		5:45		5:12	cloudy	cloudy	7:45	7:18	17
Hatching	May 21						cloudy	7:46	8:00	30
	May 22		5:01‡		5:11	cloudy	cloudy	7:46	7:27	65
Nestling Period	May 23	4:42			5:10	cloudy	clear	7:47	7:33	81
	May 24		5:08		5:09	clear	clear	7:48	7:34	84
	May 25	4:46	4:53	7	5:09	clear	clear			90
	May 26		4:54		5:08	clear	cloudy	7:50	8:08‡	102
	May 27	4:51	4:58	7	5:07	clear	cloudy			113
	May 28	4:45	4:53	8	5:07	cloudy	cloudy	7:51	8:08	96
	May 29		4:57		5:06	cloudy	cloudy	7:52	7:58	103
	May 30	4:35	4:57	12	5:06	clear	cloudy	7:53	7:41§	92
	May 31		4:51		5:05	cloudy	cloudy	7:54	7:52§	101
	June 1		4:48		5:05	clear	clear	7:55	7:55§	95
	June 2						cloudy	7:55	7:38§	102
	June 3		4:55		5:04	cloudy	cloudy	7:56	7:36§	97

* Twenty-five watt light on porch burning.
† So awkward in darkness that porch light was switched on.
‡ Female had much difficulty feeding due to darkness.
§ Female did not remain on nest at night; fed and left.

Feeding difficulties. At hatching time the female did most of the feeding. The male fed very little of the food that he brought. One time he stubbornly evaded her repeated attempts to get the morsel and finally

TABLE 4. NUMBER OF RETURNS TO NEST PER HOUR DURING SECOND NESTING

Hour	Incubation Period										Average per hour	Nestling Period											Average per hour
	May											May									June		
	9	10	11	14	15	16	17	18	19	20		23	24	25	26	27	28	29	30	31	1	3	
4 A.M.	0	0	0	0	0	0	0	0	0	1		3	0	5	2	2	2	1	1	3	3	1	2.1
5 A.M.	0	1	1	1	2	3	2	2	1	1	1.4	6	8	4	9	13	10	10	10	9	7	8	8.5
6 A.M.	0	1	1	2	0	0	2	2	0	2	1.0	6	7	5	5	8	5	10	9	5	10	11	7.3
7 A.M.	0	2	2	2	2	2	1	1	1	0	1.3	6	6	6	9	11	3	5	6	11	7	7	7.0
8 A.M.	1	2	1	1	1	1	1	1	2	1	1.2	6	2	4	5	6	8	6	6	8	8	7	6.0
9 A.M.	1	1	1	1	1	2	0	1	0	2	1.0	6	6	5	6	6	7	12	7	7	5	4	6.4
10 A.M.	0	0	1	1	0	0	1	1	2	1	0.7	7	5	8	9	9	7	9	8	8	7	6	7.5
11 A.M.	1	1	2	1	1	1	1	0	2	1	1.1	6	5	8	7	6	8	7	5	9	6	7	6.7
12 M.	1	1	1	1	1	1	1	1	0	1	0.9	1	7	4	2	6	3	3	4	6	6	6	4.3
1 P.M.	0	1	0	1	1	0	1	0	2	2	0.8	4	4	6	7	7	8	8	8	4	8	8	6.5
2 P.M.	1	2	2	1	1	1	1	1	0	1	1.1	4	8	3	8	4	8	6	5	6	3	7	5.6
3 P.M.	1	1	1	0	1	1	1	2	1	0	0.9	4	6	6	3	11	7	7	2	6	4	7	5.6
4 P.M.	1	0	1	1	0	2	2	1	1	1	1.0	5	4	4	8	5	7	5	7	6	5	4	5.4
5 P.M.	1	1	1	1	1	1	1	1	2	1	1.1	9	4	6	5	7	5	4	5	5	6	6	5.6
6 P.M.	1	1	2	1	2	1	1	1	1	1	1.2	4	5	12	9	5	4	5	4	3	5	5	5.6
7 P.M.	1	2	1	2	1	2	1	2	1	1	1.4	4	7	4	6	6	3	5	5	5	5	3	4.8
8 P.M.	0	1	0	0	0	0	0	0	0	0		0	0	0	2	1	1	0	0	0	0	0	0.3
Total for each day	10	18	18	17	15	18	17	17	16	17	Gross Average 16.3 per day	81	84	90	102	113	96	103	92	101	95	97	Gross Average 95.8 per day

it fell into the nest. Both attempted to regain it, and the female got it and collided with the porch wall in hurriedly departing. Another time she kept the nestlings covered as the male called and offered the food. She did this another time but when he attempted to push a May beetle beneath her, she grabbed it and tore off a piece which she promptly swallowed as he left the nest in a hurry with the other part. Often the male hurriedly gave the food to the female; other times when he lingered, she returned part or all of it to him. Occasionally she ate the food herself after a little or no effort at feeding the young. She took the food one time and left the nest after he had gotten no response from the nestlings. Such behavior occurred to some extent during all of the nestling periods, but was not common.

The male once ate a black swallow-tail butterfly (*Papilio polyxenes*) and evinced distaste by wiping his bill and gulping. Next day when he suddenly approached several of these butterflies congregated on the pink flowers of a prostrate *Saponaria* plant, he flung away a large mouthful of food and wiped his bill in the air and on the walk. It certainly looked as though he had remembered the experience of the previous day. He afterward picked up the scattered food.

Appeasing hunger without food. Both birds used their empty bills in apparent attempts to pacify the hungry nestlings, but were not always successful. The female often did this when returning to the nest for the night without food or whenever she raised herself up, day or night, and the nestlings responded.

Relative feeding ability of the adults. Except for the first and last two days of the nestling period, the male provided as much, if not more, food than the female. In all three nests he noticeably shirked feeding on the day before the nestlings were fledged. He usually lingered near the nest, often with food, or visited it without feeding but never shirked removing excreta on these visits. The female was kept very active providing food plentifully during this time. After the young were fledged, he again provided food rather well for a few days. It must be remembered that the female spent more time at the nest than the male, and so had less time in which to collect food. She often spent much time on the nest during cool mornings when food was usually more easily obtained than later in the day when she had more time away from the nest.

Outside influences on type and amount of food. The number of trips to the nest are not a reliable index to the amount of food the nestlings received. On one trip five times as much food might be carried as on the next. Such things as weather, spading of soil, mowing of lawns, time of day, physical conditions of the adults, disturbances, and other factors often influenced the types and amounts of food. One day the adults suddenly changed from the main item of caterpillars to the

larvae of May beetles. Investigation disclosed that a neighbor had just spread out an old compost heap.

Both birds at times slowed down their feeding activities. One afternoon the fluttering of a foot-long strip of white cloth so disturbed the male that he often neglected to feed. The female occasionally joined him in feebly protesting, but evidently did not know the reason, for she perched directly beneath the waving cloth. The male soon became quiet when the cloth ceased to move.

Feeding of the young as shown by Tables 2, 3, and 4. In Tables 2 and 3 is shown the records by electrical apparatus for 10 days during the first nesting period and for 12 days during the second. Many of these were verified by direct observation.

The first 2 days of both records show 81 to 84 meals or trips per day; on the third day there were 89 and 90 meals respectively for the first and second brood; while afterwards the first brood of 3 young received 82 to 99 meals per day and the second brood of 4 young received 92 to 113 meals.

There was little variation in the number of meals brought throughout the nestling period. Occasionally during the first 3 days of the period more food was carried to the nest than was consumed by the young so that the adults had to consume part of it themselves or carry it away from the nest. This was especially true with the first brood. During the third and fourth days the amount of food brought to the nest at a time seemed to be increasing. The adults seemed in such a hurry that often angleworms, caterpillars, May beetle larvae, and possibly other insects were much alive when fed to the young. In fact, at times I felt anxiety for the young when live larvae of the May beetle were fed but the birds seemed none the worse. Although the nestlings in each brood varied noticeably in size, all seemed to receive sufficient food.

Table 4 gives the number of returns to the second nest per hour for 21 days. The averages for 11 days during the nestling period ranged from a minimum of 4.8 trips per hour in the late evening to a maximum of 8.5 per hour in early morning.

A further check was made over this period to determine at which time of the day the birds fed most busily. It was found that there were no absences between trips longer than 25 minutes for the entire period between 9:54 and 11:22 A.M. but during the other hours of the day it ranged from 25 to 60 minutes.

Table 4 shows that the 4 nestlings of the second brood averaged receiving 95.8 meals per day over the period of 11 days which the Table covers. The 3 nestlings of the first brood averaged 89.2 meals per day for a period of 10 days. There was an average of about 13.4 hours of possible daylight during the 10 day period and 14.7 hours for the 11 day period. Therefore the 3 nestlings of the first brood received

a meal each 9 minutes of the possible daylight, and the 4 nestlings of the second brood received a meal each 9.2 minutes of the possible daylight.

Departure from the Nest

April 29, 15 and 16 days after hatching, the three nestlings of the first brood left the nest all within a few minutes of 10:30 A.M. The two largest ones dropped out of sight at once but we found that the male was caring for them in the rear yard across the street. The smallest one was fed by its mother for 11 days, after which she ceased to feed it and the father only fed it occasionally. Even though the bird was capable of securing its own food, it often chased after the adult Robins of the neighborhood cheeping and with wings quivering. Several times it followed the male Robin of the neighboring nest to the corner yard, where he often gave it the food he was getting for his own offspring still in the nest! However, his mate did not feed the strange young bird and seemed to take its pleadings as dangerous threats. One day she arrived at the bath while the young one was there and when it opened its mouth and quivered its wings, she sprang into the air about two feet and dropped on the lawn beside the bath. This performance was repeated several times before the young Robin seemed to become angry and clapped its bill at her each time she returned to the bath. After several minutes more she flew away complaining. By the eleventh day away from the nest, the bird became haughty and greeted Robins and other birds with clapping bills and spread tail when they came to the bird bath which it monopolized. Its threats were very effective against all the Robins, English Sparrows, and a Starling. One day the bird in chasing a male English Sparrow away collided with a small elm and cried loudly. Several species of birds collected to scold. Our male Robin lingered long after the others and alternately sang and scolded.

On June 4, 14 days after hatching, the oldest nestling of the second brood left the nest at 7:57 A.M. and flew 33 feet to a perfect landing in a small elm tree. Two others flew about 20 feet on leaving the nest.

The three young of the third brood left the nest July 7, about 14 days after hatching and remained very close to the nest for several days. Two of the birds remained very closely associated with the adults for 11 days. This brood remained closer to the nest than the others and the adults seemed to care for them longer. The fledglings, however, did not beg for food like the one of the first nest.

General Habits

Preening. The female always preened first after leaving the nest in the mornings during incubation and later searched for food. During the nestling periods she usually preened a very short time before searching for food. She frequently preened in the nest, day or night, during both periods but never made any vigorous movements.

Dust bathing. Neither of the adult Robins were interested in the dust bathing so much enjoyed by the English Sparrows. At times the male was seen preening on the ground near the sparrows in the dust but he never showed an inclination to join them.

Sun bathing. Both adults often spread themselves in the sunshine. The female on warm sunny afternoons usually spent a short time away from the nest leaning to one side, with body feathers open, and upper wing and tail spread to the sunshine.

Water bathing. Both bathed frequently in the bird bath and were not always dry before taking up duties of the nest again. The male was observed to bathe during drizzling weather and even at twilight on such days. He was also seen to hop through deep puddles of water on rainy days and go to the bird bath and bathe.

Relationship with Other Birds

Early in the season four or five male Robins could be seen about our yard but as the nesting season approached, there was a general skirmish between the birds. They would follow each other about and finally climb into the air as they came together in a fight. This behavior soon ceased and our male was never bothered by other Robins encroaching.

The territory of our male was an irregular area of about 35,000 square feet with the north and south boundary never actually determined by us. On the northeast and southwest border he often trespassed and was chased away by other Robins but without a fight. He regularly trespassed on some of the ground which we thought belonged to the neighboring male. Neither male seemed to resent the other, although each kept at a distance.

During the second incubation another female Robin attempted to build a nest on the top ledge of the center column of the porch but our female dashed at her each time she came with nesting material. A few times she perched on top of the column until the other female arrived. The next morning the other female selected a very conspicuous site on a neighbor's porch about 30 feet from our nest.

Our female did not patronize the adjoining lawn as much as did the other female. Whenever they were on the lawn at the same time, they appeared to be following each other about. When one female was cornered in the shrubbery, she crouched slightly with tail spread and bill smacking. This was a signal for retreat and the other bird took her turn being followed. They never actually fought. The neighboring male kept remarkably free of the vicinity of his own nest except when actually visiting it or bathing. His other two nests were built within his own boundaries. His mate was very bold and often contested the lawn with our male. She seemed most interested in fighting when our male carried food. During incubation it appeared that she sometimes left her nest seemingly at the sight of our male Robin with food. It

was disgusting to see our male so foolish as to attack her whenever he carried food for he always lost it, piece at a time. They climbed into the air as they fought, just as the males had done earlier in the season. Our male usually was the one to fly away first and then sometimes after preening on the walk for a few minutes, the female would return directly to her nest.

Last summer I saw the same behavior between a male and female Robin over rich biscuit mixture which was placed beneath a large drop trap near the rear steps. A male English Sparrow often was at hand to benefit, for the Robins soon dropped their mouthfuls of food outside the trap under which the sparrow would not go.

Our male Robin adopted a possessive attitude towards the three trees near his third nest and protested the presence of adult Robins, Blue Jays, Catbirds, and Bronzed Grackles. He disregarded Flickers, Downy Woodpeckers, English Sparrows and Song Sparrows.

One day as he was on his way to the nest with food, he swerved sharply to dip towards a Bronzed Grackle on the lawn. The Grackle spread its wings until the tips touched the lawn in a peculiar manner. During the third nesting a pair of Blue Jays visited the trees near the nest of the Robin. This was very annoying and often caused a fight. The Jays evaded the Robins in the trees but in the open our male Robin clinched with them at once and the female soon joined in the fight. The Jays finally retreated, with the Robins following them for several hundred feet. After the young Robins were fledged this trouble ceased.

One day I heard a commotion and found the Robins and Jays almost side by side protesting the presence of a male Sparrow Hawk. The Jays soon drove the hawk away with the aid of the Robins. During this time the Robins seemed entirely friendly with the Jays.

Summary

1. The abnormally warm weather of March 1935 started the nesting season earlier than usual. The female selected the sites and built three nests without the aid of the male.

2. Incubation began in all nests the evening following the depositing of the second egg and lasted for 12½ to 13 days. The male did not cover the eggs or young at any time nor feed the incubating female.

3. The first egg of the first set was laid at 10:58 A.M., the second between 2 and 2:15 P.M. the following day.

4. One bird gave the food reaction when 6 minutes old; at 2½ hours it peeped incessantly.

5. During incubation the female left the nest from 10 to 19 times a day, averaging 16.3 times. Forty periods on and off the nest averaged

44 minutes on and 11 minutes off (i.e. 80 per cent of daylight hours on the nest).

6. The male could see well in dim light, but the female could not.

7. For the first two days with both broods the young received between 81 and 84 meals per day; the third day they were given 89 and 90 meals respectively. During the rest of the time the first brood of 3 young received 82 to 99 meals per day and the second brood with 4 young 92 to 113 meals.

8. The young left when 14 to 16 days old. One could not fly as far as 14 feet, while two flew 20 feet and another 33 feet.

9. One Robin 4 weeks old monopolized the bird bath, threatening adults of 3 species.

10. A nesting female often left her eggs and attacked a neighboring male as he carried food to his young.

1532 Aberdeen Avenue, Columbus, Ohio.

THE HERRING GULLS OF HAT ISLAND, WISCONSIN

BY MURL DEUSING

HAT ISLAND is a small rocky island in Green Bay about three miles off shore of Egg Harbor, Door County, Wisconsin. The island is roughly triangular in shape and about 300 feet in diameter. It is covered with a heavy growth of nettle and dogwood. About a dozen trees grow on the island. Three to four hundred pairs of Herring Gulls (*Larus argentatus smithsonianus*) nest on the island every year.

My first introduction to the island came when I accompanied Harold Wilson, well-known bird bander of Door County, on his annual banding trip to the island in 1935. Over 800 young were banded on the island during that trip. In 1936 I returned to Hat Island with my wife, intending to camp on the island and make observations. On the first day I fell among the rocks and broke my ankle, forcing a postponement of the work to the next year. In 1937 we returned to the island and made observations and pictures of the nesting life of the gulls through a five-day period. We arrived on June 12 and left the island on June 17.

Nest and Young

Upon our arrival we found only 9 nests with eggs. All others had hatched and the island was overrun with young in all stages of development. Six of the 9 nests contained pipped eggs. Our observations of these nests showed hatching in the same clutch of eggs taking place at intervals of 12 to 24 hours. Ten to 48 hours elapsed from the time the egg was first cracked to the time the young finally freed itself of the egg shell. On some of the newly hatched young we found the yolk sac still exposed, the sac ranging in size from one-fourth to three-fourths of an inch in diameter. The new young rested upon the yolk sac as if it were a cushion and only by turning them over on their backs could the sac be observed. The yolk sac disappeared within 24 hours after hatching.

The young generally stayed in the nest for the first 2 or 3 days unless the nest was exposed to the sun and the adults failed to shade the young. In this case the young left the nest on the day of hatching and crawled into the nearest shade. They were very adept at hiding. As we approached, the young would run pell-mell in every direction, hiding in the thick growths of nettle and shrubbery or under logs and driftwood. We had to be very careful in stepping on driftwood for fear of crushing some young gull that might have taken refuge under it. Some young stuck only their heads under the logs, while others merely crouched among the rocks. In either case their gray, mottled down made an effective camouflage. Young gulls near the shore ran to the water and swam out into the lake with determination

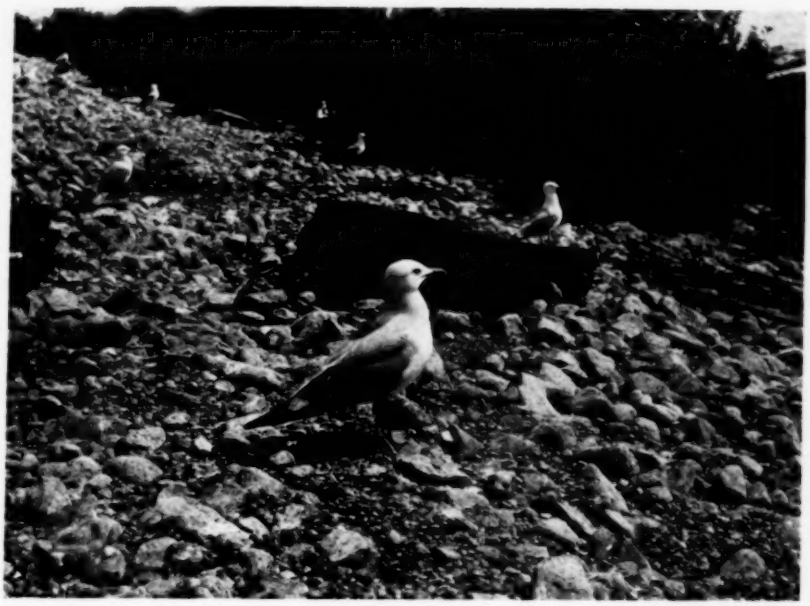

Fig. 1. Gulls guarding their territories

Fig. 2. A gull trumpeting

and skill. Occasionally an adult gull would attempt to protect the young by swooping down upon us. Though these gulls skimmed close overhead they did not actually strike us at any time.

Territorial Organization of Breeding Grounds

Several blinds were built to observe the behavior of the gulls on the nesting grounds. From the blinds we noted a very definite organization of the breeding grounds into territorial divisions similar to that described by Herrick (1935) for the Herring Gulls of Great Duck Island, Maine. The territories had an average area of about 65 square feet. Territories were almost constantly guarded day and night by one or both of the adults, though occasionally a territory would be left unguarded for several hours. A few of the territories seemed to be held by only one adult, and these, of course, were left unguarded during some periods of the day. While on guard in the territories the adults spent much of their time in sleeping, preening, scolding, or fighting. The gulls had quite a repertoire of scolding and clucking notes as well as a peculiar trumpeting call. In making the trumpeting call a gull lowered its head almost to the ground and opened its bill widely as if about to regurgitate. Then throwing the head high, and holding the bill wide open, it uttered a series of 4 to 20 harsh but resonant calls which sounded like, *ku-uh, ku-uh, ku-uh, ku-uh, ku-uh, ku-uh.* Often some disturbance, such as a lost young running through the colony, a pair of fighting adults, or the flapping of the burlap on the blind, set the whole colony to bellowing. Occasionally a pair of gulls engaged in a peculiar performance which looked much like a mating dance, though the season for courtship was long over. Two gulls, facing each other, would bend their heads together as if exchanging confidential secrets, clucking softly all the while, and shaking their heads in the jerky rhythm of feeding ducks. These "clucking matches" were usually performed by the gulls during a period of general excitement.

The boundaries of each territory were zealously protected by the gulls on guard. If any other gull trespassed into the territory or even by miscalculation landed in its neighbor's area, a fight was the immediate result. Pecking and parrying fiercely, they would grasp each other by the neck or bill and twist and pull vigorously with much flapping of the wings. Occasionally one gull grasped the other by a wing and jerked it about violently or even twisted the other gull upon its back. After several minutes the fight would end abruptly with the intruder beating a hasty retreat and leaving the rightful owner of the territory to trumpet wildly with excitement. Sometimes the fighting gulls stopped abruptly and one or both would begin to thrust viciously at driftwood and sticks, or sometimes they would savagely tear the leaves from nearby shrubs and nettles. During these periods of high

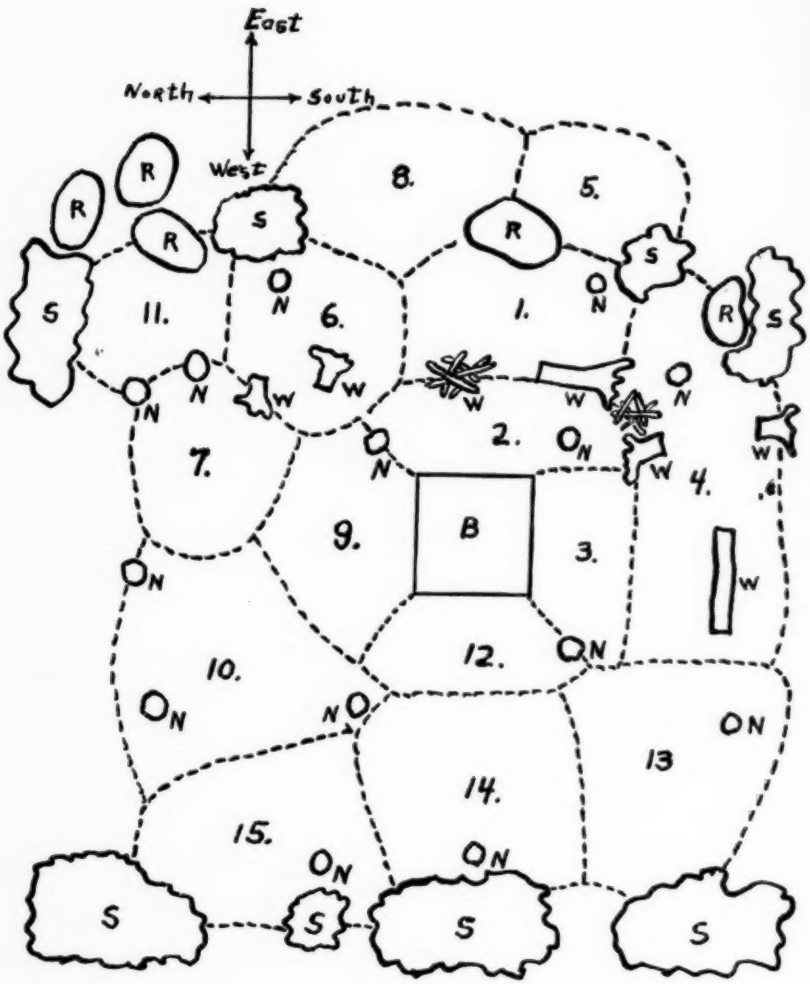

Figure 1. Map of Herring Gull Territories.

B—Bird blind (6 by 6 feet)
S—Shrub
R—Rock
N—Old nest
W—Driftwood

excitement a gull sometimes picked up and carried about a piece of wood or rubbish. The excitement of the fight was highly infectious and most of the gulls in the vicinity would trumpet loudly during such a squabble. While adults did not seem to injure each other seriously during these fights, they all carried the battle scars on their heads and bills. By watching these fights closely we were able to determine the exact boundary of each territory.

Young gulls as well as adults had to respect these territorial claims. If a young gull was caught in any other territory but that of its parents it was brutally attacked and sometimes killed. This killing of trespassing young probably accounts for the large number of dead young found on the island. Several times we saw unprovoked attacks by adults upon young out in the open water and on parts of the island where no territories existed. The bulk of the killings, however, were due to the vigorous defense of territorial boundaries by adult gulls.

Some of the young gulls never left their home territory and so received the full protection of their parents. These young were usually fortunate enough to have shrubbery or driftwood in their territory under which they could hide in an emergency and where they could find shade during the hot part of the day. Other young habitually left the territory even though they were not disturbed. One family of 2 half-grown young, living in Territory No. 12 (see map), habitually left their territory to go down to the beach to bathe and swim or to sleep in the nearby shrubbery. These two young were experts in running through strange territories and in dodging the vicious thrusts of the adults they passed. Not all young were so successful. Sometimes an adult gull would catch a trespassing young by the neck and shake it unmercifully or pound it over the head until it was seriously injured or dead. During such a struggle the young one would scream pitifully, and the surrounding neighborhood of gulls would be thrown into a chaos of excitement. No gull, not even the rightful parents of the young bird, would come to its rescue. We saw the gull of Territory

TABLE 1

CENSUS OF GULL FAMILIES FOUND AROUND THE BLIND

Territory number	Number and age of young	Remarks
1.	1 young, ⅔ grown	
2.	2 young, ⅓ grown	
3.	2 young, ½ grown	
4.	2 young, ½ grown	
5.	3 young, ½ grown	On the third day one of these young was killed by the adult in No. 1
6.	3 young, ¼ grown	Two of these young disappeared on the third day
7.	1 young, ⅓ grown	
8.	3 young, ½ grown	On the first day one of these young was killed by the adult in No. 6
9.	3 young, ½ grown	All of the young in this family disappeared on the second day. Possibly they moved out, though an adult continued to guard the territory
10.	2 young, ½ grown	
11.	1 young, ⅓ grown	
12.	2 young, ½ grown	
13.	1 young, ⅓ grown	
14.	3 young, ⅓ grown	
15.	3 young, ½ grown	

No. 8 stand by and watch the adult of Territory No. 6 brutally murder one of its young. The gull in Territory No. 8 trumpeted and scolded but refused to cross into its neighbor's territory to aid its young. If the young one broke away from its tormentor and crossed the invisible boundary line into its own territory its parents would vigorously protect it, refusing to let any gull other than their own young come into the home territory. Sometimes an adult gull would eat the young it had killed, ripping it open and eating the entrails. On one occasion we saw an adult gull feed to its own young the entrails of a young it had just killed. At another time we saw a gull swallow entire a young about one-third grown.

Feeding of the Young

Each gull fed its young in its own territory. Occasionally the young from a nearby territory might rush in to partake of the food delivered, but they were always discovered and summarily driven out by the adult gull. More frequently a neighboring adult would rush in and attempt to snatch away some of the food. At no time did we observe an indiscriminate feeding of young or the mobbing of an adult by the young for food as described by Ward (1906) on Gravel Island, Wisconsin. We did see a few feedings outside of territorial boundaries. Twice we noted feedings out on rocks in the water some distance from shore. These rocks were not held as a territory by the adult gulls. In another case we saw a feeding out on a rocky spit, which was not held as a regular territory by adult gulls. All of these cases happened in the vicinity of our camp and probably were caused by the disruption of the territories by our camping activities. On the undisturbed portion of the island where we kept our blinds and did most of our observing there was no flocking of the young and no feedings outside of territorial boundaries.

Gulls, heavily laden with food, came in from over the lake in straight, business-like flight, and flew directly to their territory. Sometimes the young would rush to the adult as it landed, apparently recognizing the adult while it was still in the air. If the young did not appear promptly the adult would bend its head low and utter a soft cry. This cry usually brought out the young if they were in the vicinity. When the young reached the adult they would stop abruptly in front of it and begin to bow and bob, reaching up occasionally to peck at the bill of the old gull. Within a few minutes the lower neck of the adult gull would begin to swell, the swelling becoming most pronounced just in front of the shoulders. With several convulsive movements the gull would stretch its neck to the ground, open its bill widely, and regurgitate the food upon the rocks. The young would quickly grasp the food and, throwing back their heads, greedily gulp it down. Often they would begin their begging movements again, bowing and bobbing before the adult.

The food most frequently delivered to the young was fish. Once we saw a fish at least a foot in length regurgitated by an adult and swallowed entire by a half-grown young. Occasionally perch 6 to 9 inches long were regurgitated, but the usual fare for the young gulls was chubs and minnows 4 or 5 inches in length. Sometimes the food was so predigested that it was impossible to identify it. This predigested fare formed most of the food for the smallest young, though occasionally the largest young received it. Several times we noticed a very peculiar food regurgitated by the adults. It looked much like coffee grounds which the young would pick up particle by particle. We were very much puzzled by this strange fare and finally, at the next feeding of this kind, ran out of the blind, frightening away the adult and the young before they could recover the food. We found it to be a mass of small beetles partly digested.

Sometimes the adults were very slow in regurgitating, taking as much as 15 minutes from the time the swelling first appeared on the back of the neck until the food was deposited upon the rocks. In such cases the young that had first started the regurgitation process by begging movements often became discouraged and retired into nearby shrubbery. The adults, however, were never perturbed by the failure of the young to partake of their offering; they simply swallowed the whole lot again. There were no leftovers from a meal. In fact, the young and the adult frequently fought and scrambled over the food, once it was regurgitated, both swallowing greedily.

Summary

Among the Herring Gulls of Hat Island there was a definite territorial division of the breeding grounds. The young, at least until they were half-grown, were fed almost exclusively in these territories. The adult gulls were discriminating and fed only their own young. Territorial boundaries were protected by the adults by vigorous fighting. Trespassing young from neighboring territories were frequently killed in this defense of territory by an adult gull. Adult gulls made no attempt to rescue their own young which had strayed out of the home territory and were then attacked by other adults. The food brought in by adults consisted usually of fish but sometimes of quantities of small beetles.

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Milwaukee Public Museum, Milwaukee, Wisconsin

FOOD OF THE STARLING IN CENTRAL NEW YORK STATE

BY ALTON A. LINDSEY

THE Starlings *(Sturnus vulgaris)* used in this study were collected by the writer during the years 1931–1933 and 1935–1936 about Ithaca, Hamilton, Cortland, Elmira, Binghamton, and Owego, N.Y. The total number of 1,268 stomachs includes 149 nestling stomachs taken in May and June of several years. Most of the adult birds were shot. However, in early spring many were secured at steeple roosts, and, although taken as soon as possible after their arrival, a large number of these contained insufficient food for use in estimating percentages. The percentage figures presented are calculated by volume of food and are based on 661 adults and independent juveniles and 139 nestlings. The results of the examination of these 800 stomachs are summarized in Table 1, which includes those food categories constituting at least 1 per cent of the annual food or else at least 2 per cent of the food during one month.

In order to gain an idea of the quantity of food brought to nestling Starlings, observations were made at two nest boxes fastened inside knot-holes in the side of a barn. Three periods of continuous observation totaled 10 hours, during which time feeding visits occurred at intervals averaging 13.6 minutes. All observations were made between 7:30 A.M. and 5:30 P.M. One of the nests contained but one nestling, which during eight hours was fed, by the female only, at an average interval of 14 minutes. This four-day old bird received during the eight-hour period on July 12 the following recognizable food items: 23 lepidopterous larvae, apparently chiefly of the smooth-skinned cutworm group; 11 larvae of the May beetle (*Phyllophaga*); 1 large grasshopper; 2 crickets; 2 ants; 1 wasp; 2 ground spiders and several spider egg-cases; 2 harvestmen; 1 milliped; and 2 earthworms. Many smaller insects were unidentified, and doubtless others were unseen within the mouth of the adult. Beginning two days later a record of the weight increase of this nestling was kept. It might be expected that with exclusive attention a single nestling would gain more rapidly than one member of a large brood. That such is not necessarily the case is indicated by the following data:

Age in days	1–5	6–10	11–15	16–20
Daily gain by solitary nestling (grams)	...	3.5	1.9	—1.1
Mean daily gain by five nestlings of one nest	4.8	5.3	1.3	1.2

Not only do the nestlings fail to gain weight during the last few days in the nest, but an actual loss occurred in both nests studied. When

16 days of age the solitary nestling weighed 74.0 grams, while it weighed but 68.3 grams when 19 days old, or one day before leaving the nest. The mean weight of the five nestlings dropped from 77.3 grams at 20 days of age to 75.0 grams at 22 days, the day before they flew. Probably the adult Starlings in these instances brought considerably less food than previously. Kalmbach and Gabrielson (1921) report that the average interval between feedings on the day before young Starlings left the nest was about twice that for the entire nesting period. The latter figure they found to be 6.1 minutes, with both adult birds bringing food.

As shown by Table 1, the proportion of vegetable food in the diet of nestlings is only about one-eighth of that of the adults. The identifiable vegetable items (other than garbage) from the 800 stomachs include 58 species representing 41 genera. Vegetable matter constitutes 41.4 per cent of the food of non-nestlings throughout the year. During December, January, and February more than half of the volume of food is vegetable matter, chiefly from garbage. The latter category, of course, includes also refuse of animal origin. Three-fourths of the December diet is vegetable, for the maximum amount of wild fruit, especially staghorn sumac (*Rhus typhina*) fruits, is consumed during that month. In February garbage forms more than three-fourths of the Starling's food.

It has been suggested that by feeding on wild fruit during the winter the Starling decimates the supply available for the early spring migrants. In March fruits of various dogwoods make up 1.3 per cent and *Viburnum* fruits 2.5 per cent of its food. This indicates that in the region of this study wild fruits are still available to Bluebirds and Robins during the previous month, February, in considerable quantities. If further increase in the numbers of Starlings occurs, competition of this sort with native species may become critically important.

When the cherries ripen, the Starling returns to vegetable food after three months of an overwhelmingly animal diet. The genus *Prunus* supplies 3.3 per cent of the annual food; about 1 per cent is the cultivated cherry in the region under discussion. Kalmbach (1928) reported the consumption of cultivated cherries in July as 15 per cent, while our findings give 10.5 per cent for this month, indicating less destructiveness to this crop in the local region than in the six eastern States covered generally in the earlier study.

Apples comprise less than 1 per cent of the food during the four months from August through November, and doubtless some of these are obtained from garbage or waste fruit.

The months when corn bulks largest as a food item are February and March. From May through September corn is unimportant, being less than 1 per cent in each of these months. It is clear that the corn gleaned during the fall and early spring is practically all waste grain.

The buckthorn (*Rhamnus cathartica*) was found in November stomachs only, forming 8.3 per cent of the month's food.

In the animal food of the Starling, the millipede is prominent. It makes up 14.2 per cent of the yearly diet and about half of the April food. According to Crosby and Leonard (1918), "Numerous species of millipedes belonging to several genera have been found injurious in America. . . . It is true that they prefer decaying vegetable matter but it is also well known that they will attack healthy roots." MacLeod and Rawlins (1933) report that these diplopods occasionally inflict severe injury on potato tubers in central New York. The Starling's fondness for millipedes is therefore of some economic interest.

No animals except millipedes and insects are important in this bird's dietary. Earthworms, a snail (*Cochlicopa lubrica*), and a crustacean (the sow-bug *Porcellio scaber*), each constitute about 0.1 per cent of the annual food, while arachnids form 0.2 per cent.

One hundred ninety-one species of insects, representing 55 families, were determined from the 800 stomachs. Orthoptera are of importance in the food of the nestlings, the single species *Gryllus assimilis* forming 2.6 per cent of their diet. Thirty-four nestling stomachs contained representatives of the Gryllidae. Adults also consume a large number of crickets in May and June, and of grasshoppers in August and September.

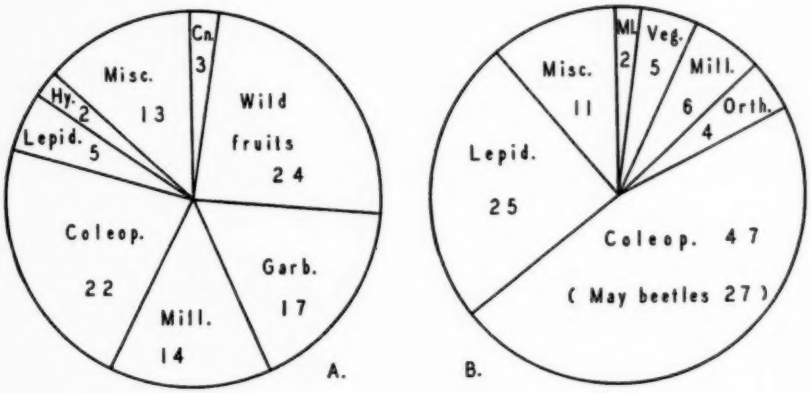

Figure 1—Percentages of the principal items in the food of: (A) 661 nonnestlings taken in all months, (B) 149 nestling Starlings taken in May and June. Cn., corn; garb, garbage; mill., millipedes; Coleop., Coleoptera; Lepid., Lepidoptera; Hy., Hymenoptera; misc., miscellaneous; ml., mineral matter; veg., vegetable matter; Orth., Orthoptera.

The predominant hemipterous insects eaten by both adult and nestling Starlings are the stink-bugs *Euschistus* and *Coenus* of the Pentatomidae. These bugs occur in stomachs collected in every month of the year, and their easily recognized fragments were very commonly found in winter stomachs. Crosby and Leonard (1918) wrote that

TABLE 1
MONTHLY PERCENTAGES OF ITEMS IN STARLING STOMACH CONTENTS

	Adults and Independent Young													Nestlings		
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual	May	June	Both
Number stomachs.....	54	48	72	117	22	17	39	57	84	38	31	82	661	107	32	139
Mineral matter	1.8	2.0	1.9	0.9	0.4	.05	.07	....	....	0.8	0.2	1.4	0.8	2.6	1.2	2.2
Vegetable matter	56.4	56.5	46.7	7.1	0.5	2.4	40.6	43.4	53.4	34.1	42.5	75.6	41.4	5.5	2.8	4.9
Corn	....	8.8	11.5	1.3	....	....	....	....	....	4.9	3.1	....	2.5	....	....	....
Wild fruits	12.0	2.2	24.0	2.7	....	....	30.1	42.4	49.0	13.3	30.6	49.7	24.2	....	....	....
Wild cherries	....	....	....	....	....	....	26.5	9.3	1.3	....	2.0	....	2.6	....	....	....
Cultivated cherries..	....	....	....	....	....	....	10.5	2.2	....	....	....	....	0.8	....	....	....
Sumac fruits	8.5	1.7	19.8	1.6	....	....	....	1.9	0.9	4.9	5.6	38.7	8.8	....	....	....
Wild grape	....	....	....	....	....	....	....	....	1.3	....	9.2	3.6	1.1	....	....	....
Dogwoods	1.5	....	1.3	....	....	....	....	....	3.7	6.7	....	....	1.2	....	....	....
Viburnum	....	....	2.5	....	....	....	....	....	....	....	....	....	....	....	....	....
Sambucus	....	....	....	....	....	....	....	26.3	39.6	....	....	....	7.3	....	....	....
Garbage	57.4	77.7	19.5	3.8	....	....	....	0.3	0.7	1.8	2.6	26.0	16.7	....	....	....
Millipeds	....	....	6.5	48.5	29.0	30.1	2.0	0.1	2.2	40.4	8.8	0.1	14.2	5.1	9.9	6.2
Orthoptera	1.0	0.2	....	....	2.7	8.4	2.2	3.5	3.8	2.8	....	....	1.7	3.6	7.0	4.4
Gryllidae	....	....	....	....	1.7	7.6	....	....	....	....	....	....	0.6	2.7	6.9	3.7
Acrididae	1.0	0.2	....	....	....	....	1.2	3.5	3.0	0.2	....	....	0.8	....	....	0.7
Hemiptera																
Pentatomidae	2.7	....	1.2	1.8	....	....	1.1	....	1.6	2.1	1.2	....	1.2	1.9	1.1	1.7
Coleoptera	2.4	2.6	22.5	30.3	38.3	35.4	36.6	42.0	31.2	15.1	39.0	6.4	22.0	53.9	23.5	46.9
Elateridae	....	....	....	....	7.0	....	1.2	....	....	....	6.9	....	0.8	....	....	0.6
Phyllophaga	....	....	....	....	9.7	20.7	....	....	....	....	....	....	0.9	33.5	5.8	27.0
Curculionidae	....	2.1	15.6	6.0	13.7	....	15.1	15.5	1.1	9.9	24.8	5.5	10.1	4.5	0.8	3.7
Hypera	....	....	13.3	5.0	12.9	....	3.7	20.9	0.5	4.6	8.1	4.5	6.0	4.4	....	3.6
Lepidoptera	2.3	0.2	3.9	.9	13.0	6.0	9.0	1.3	0.6	0.3	3.0	1.1	5.0	20.2	38.6	24.5
Diptera	....	....	....	....	....	....	2.4	1.5	....	....	....	4.6	1.1	....	....	....
Hymenoptera	....	....	2.3	2.6	2.1	0.9	2.4	1.1	10.1	....	....	....	2.4	....	3.8	....
Ants	....	....	....	1.2	....	....	1.0	1.0	10.1	....	....	....	1.7	....	....	....

Euschistus is said to hibernate in the adult state. This is apparently correct, since the January percentage for these two genera is greater than for any other entire order. If these insects were dead when picked up it is unlikely that they would be favored above all others. Indeed, the suggestion that the Starling may in winter eat dead insects in appreciable numbers is open to question. All the other insect species which are of any consequence as adults in the winter diet are those which hibernate.

Coleoptera form 22 per cent of the annual food of adults in central New York State, whereas Kalmbach and Gabrielson (1921) found this order to constitute 19.6 per cent. The only families we found exceeding 0.5 per cent are the noxious Elateridae, Scarabeidae, and Curculionidae. Indeed, the species of these families which predominate in the Starling's food are among the most harmful of insect pests. Beetles and their larvae make up 46.9 per cent of the nestling food.

The species of Elateridae most commonly eaten are the wheat wireworm (*Agriotes mancus*), the corn wireworm (*Melanotis communis*), and *Aeolus dorsalis*. Herrick (1925) considers wireworms among the first five pests of corn and the first twelve pests of wheat and oats.

Adult May-beetles (*Phyllophaga*) and their larvae, white grubs, form one-tenth of the food in May and two-tenths in June. This genus is notoriously injurious, especially to corn, timothy, potatoes, and strawberries (Herrick, 1925). It constitutes 27 per cent of the total food of nestlings, and well over half of their coleopterous food.

The single family of insects eaten most commonly is the Curculionidae, or snout beetles, forming one-tenth of the yearly diet and one-fourth of the monthly food in November. Although this yearly figure compares closely with the 8.5 per cent average of Kalmbach and Gabrielson, the November data from our area is strikingly different, since their study showed only 5.3 per cent for curculionids in November. However, we had only 31 November stomachs sufficiently full for estimating percentages. The favorite species is the destructive clover-leaf weevil (*Hypera punctata*) which far outnumbers any other insect species in the Starling's food, both adults and larvae being eaten. Next in importance are the clover-root curculio (*Sitona hispidulus*) and the clover sitona (*Sitona flavescens*), together constituting 1.3 per cent of the annual food and 9.3 per cent for August. Both adults and larvae of *Hypera* and *Sitona* seriously injure clovers and alfalfa. The strawberry crown-girdler (*Brachyrhinus ovatus*) is frequent in stomachs throughout the year, forming 0.1 per cent of the food. This insect winters in the adult state, as do *Hypera* and *Sitona*, which explains the remarkable number of curculionids in winter and early spring stomachs.

Lepidoptera, which Kalmbach and Gabrielson recorded as 6 per cent of the yearly food of adults, make up 5 per cent in central New York, and about one-fourth of the food of nestlings. Cutworms of the

family Noctuidae greatly predominate. Table 2 shows the forms found in adult and nestling stomachs, and the numbers of stomachs in which they occurred.

TABLE 2

LEPIDOPTERA LARVAE FROM STARLING STOMACHS

	Adult stomachs	Nestling stomachs
Pyralididae		
Crambus sp. (2 species)	5	4
Geometridae (1 species)	..	1
Noctuidae (13 species)	..	4
Unidentified smooth-skinned cutworms	5	10
Sidemia devastatrix (glassy cutworm)	..	9
Cirphis sp. (2 species)	1	3
Nephelodes emmedonia (bronze cutworm)	..	17
Agrotis ypsilon (greasy cutworm)	1	3
Feltia sp.	2	25
Euxoa sp.	6	6
Arctiidae	2	2
Apantesis sp. ?		
Estigmene acraea ?		
Hesperiidae	..	3
Pieridae	..	1

The order Diptera is represented chiefly by the larvae of the greenbottle fly (*Lucilia* sp.) which account for the entire 4.6 per cent for the order in December, but were found in no other month. *Sarcophaga* larvae comprise 0.2 per cent of the animal food, being eaten principally in July and August.

No Hymenoptera are eaten consistently except ants, represented by *Myrmica scabrinoides, Myrmica rubra, Formica fusca,* and *Lasius* sp. As a group, ants form 1.7 per cent of the annual food of adults. The remainder of the 2.4 per cent for the order is largely cocoons, which are taken for the most part in winter and early spring. However, in some cases these were doubtfully determined as hymenopterous.

SUMMARY

It may be stated in summarizing the data on Starling food for central New York State that insects (identifiable at least to order) constitute about 35 per cent of the material in adult stomachs, and 77 per cent in nestling stomachs. Vegetable matter makes up 41.4 per cent in adults and 4.9 per cent in nestlings, while mineral items are 0.8 per cent and 2.2 per cent respectively. The remainder of the food in each case is animal matter other than insects, especially millipedes, unidentified animal matter, and animal garbage.

Intensive work in central New York indicates that the economic status of the Starling, as evidenced by analyses of stomach contents, does not differ fundamentally from that determined by Kalmbach and

Gabrielson for six eastern States before this bird had attained its present numbers and distribution. The food habits are on the whole decidedly beneficial, especially in the case of the nestlings.

Acknowledgments

The writer wishes to thank Prof. A. A. Allen of Cornell University, where the research was carried on, for counsel during this study; Dr. Clarence Cottam and the staff of the Food Habits Division of the Bureau of Biological Survey for detailed determinations of insect material chiefly; and Mr. Carl Heinrich of the Bureau of Entomology for identifications of lepidopterous larvae.

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GENERAL NOTES

Glossy Ibis in Minnesota.—Heron Lake is a large body of shallow water in the prairies of Jackson County, southwestern Minnesota. On the shore of its northern, rush-grown section we saw an adult Glossy Ibis (*Plegadis falcinellus*) on June 16, 1939. The bird was wading and feeding leisurely among several summer-residing American Pintails and allowed us a close approach. Not until we had watched this bird through field glasses for ten minutes did it flush and move southward over the lake.

While the White-faced Glossy Ibis might be expected in this region in view of previous nesting records reported from here by Dr. Thomas S. Roberts ("The Birds of Minnesota," 1, 1932: 196), this individual showed no evidence of white in the very dark feathers about the base of the bill. It was obviously an adult bird in rich, reddish-brown plumage.

This highly unexpected observation of a Glossy Ibis in Minnesota leads us to wonder whether the excessive spring droughts and resulting fires in that part of its breeding range in southern Florida had been a factor in this individual's vagrancy.—Olin Sewall Pettingill, Jr. and Dwain Willard Warner, *Carleton College, Northfield, Minnesota.*

Eastern Glossy Ibis in Michigan.—On June 4, 1939, I collected an adult female Glossy Ibis (*Plegadis falcinellus falcinellus*) on the shore of Saginaw Bay in Fraser Township, Bay County, Michigan. The bird was in adult plumage and in good physical condition. No others were seen.—Miller Empey, *Freeland, Michigan.*

Nesting Record for *Cathartes aura septentrionalis* in Southwestern Michigan.—The identification of a female Turkey Vulture, collected from the nest on May 22, 1939, in Section 32, Heath Township, Allegan County, Michigan, as *Cathartes aura septentrionalis* indicates that the nesting vulture of southwestern Michigan is of this subspecies. In 1933 *C. a. teter* was ascribed to this region by Herbert Friedmann (*Proc. Biol. Soc. Wash.*, 46, 1933:189). The present specimen together with the two eggs from the nest was sent to the University of Michigan Museum of Zoology, where Dr. Josselyn Van Tyne made the identification. This vulture was a female weighing 1,830 grams. The wings measured 542 mm. and 545 mm. and the tail 286 mm. It is therefore clearly *septentrionalis* and not the smaller subspecies *teter*. As far as is known this is the only specimen of a nesting Turkey Vulture ever collected in this part of the State.

The vulture was located on her nest by the writer on May 18, 1939, while tree cavities were being examined in connection with raccoon studies on the Swan Creek Wildlife Experiment Station. Nest materials consisted of decayed wood at the bottom of a cavity which had rotted out 3 feet deep in the top of a living white oak stub. The entrance to the hollow was 15 feet from the ground. This is rather unusual as Turkey Vultures more often choose a nesting site nearer the ground in a short stub or in a fallen log or even on the ground itself. The tree, 26 inches in diameter, is situated on sandy oak upland. The latter supports second growth white oak with a few older trees such as the one in which this nest was located, and is adjacent to the Kalamazoo River flood plain.

Quite an offensive odor was noted as the tree was being climbed and, when the nest was found, it could be seen that the vulture had regurgitated part of her food which was obviously carrion. The bird remained on the nest, even when prodded with a stick. She offered no resistance and allowed herself to be taken from the cavity with a noose slipped around her body.—Frederick W. Stuewer, *Game Division, Michigan Department of Conservation, Lansing, Michigan.*

Breeding of the Lesser Scaup Duck in Southern Ontario.—During the past sixty years many statements concerning the breeding of this duck, *Nyroca affinis*, have been published from various parts of Ontario north to Lake Temiskaming. An examination of these records reveals that the only satisfactorily authenticated breeding station, prior to 1923, was at the marshes bordering Lake St. Clair, in the extreme southwestern section of the Province. There, the late J. A. Morden and Dr. W. E. Saunders recorded that a few pairs bred about 1882 (*Can. Sportsman and Nat.*, 2, 1882, p. 194); young were seen at Mitchell's Bay on June 6, 1888, according to the late Wells W. Cooke (*U. S. Dept. Agri., Biol. Surv. Bull.* 26, 1906 :47–8); and a downy young bird, one of five which were accompanying female parent, was secured at Walpole Island by W. G. A. Lambe about 1900 and placed in the Royal Ontario Museum of Zoology. The Walpole Island record was published by Paul Harrington and the writer (*Trans. Royal Can. Inst.*, 21, 1936 :16), but no recent observations on the breeding of the Lesser Scaup at Lake St. Clair have come to our attention.

Since 1923, however, this duck has been reported breeding at four additional points in southern Ontario, and evidence that it is on the increase as a breeding species seems to be accumulating. During the first week of September, 1923, Charles F. Haultain watched a female with her brood of flightless young in the drowned timberland between Baptiste and Elephant Lakes on the border of Hastings County and Haliburton District; in 1929 the late John Townson saw a female with seven young at Toronto Island daily between July 27 and September 12 (*Can. Field-Nat.*, 44, 1930 :167); on July 6, 1938 a female was seen with five young near the mouth of the Nottawasaga River in Simcoe County by Mrs. Edgar Hobbs; and on August 6, 1939 William C. Mansell watched a brood of five half-grown young at Rebecca Lake, in the northeastern corner of Muskoka District.

The statement by McIlwraith (*Birds of Ont.*, 1894 :81) that Dr. G. A. MacCallum had encountered some breeding at Dunnville, on the north shore of Lake Erie, was probably correct, but it is significant that the species was not given as breeding in Dr. MacCallum's own list published in 1892 (*Ont. Game and Fish Commission Report* :378). Nash's report that this duck used to breed at the Hamilton and Toronto marshes (*Check List of the Vertebrates of Ont.*, 1905 :17) was accompanied by no details and does not correspond to the experience of contemporary observers. Hubel's record (*Auk*, 24, 1907 :49) of several families seen on Lake Temiskaming, Temiskaming District, during the late summer of 1905 might best be considered hypothetical in the light of present knowledge. The nesting record for Frenchman's Bay, Ontario County (Baillie and Harrington, *loc. cit.*) bears insufficient data and may be withheld awaiting particulars.—James L. Baillie, Jr., *Royal Ontario Museum of Zoology, Toronto, Ontario.*

Mountain Plover in Saskatchewan.—While conducting wild life investigations in southern Saskatchewan on June 5, 1939, I discovered a Mountain Plover (*Eupoda montana*) two miles north of the village of Bracken. This point is 14 miles north of the International Boundary at an altitude of about 2,900 feet. The bird was carefully scrutinized for several minutes with 8X binoculars at a distance of 20 to 30 feet. The pale coloration of this species with its conspicuous black lores and forehead patch renders identification easy and certain. Detection of the above individual apparently establishes the first certain record of the species in Canada. The occurrence of *montana* in the extreme southern part of the Prairie Provinces has long been anticipated, especially on the Missouri drainage of southwestern Saskatchewan west of the 105th degree of longitude. It is also to be looked for in southern Alberta. In summer, the Mountain Plover haunts the dry, treeless plains and mesas of the western interior, characterized by short gramma grasses, sagebrush, greasewood and the prickly pear cactus.—J. Dewey Soper, *National Parks Bureau, Winnipeg, Manitoba.*

Killdeer Nesting at Fort Myers, Florida.—On April 1, 1939, Mr. Beaman Belvin sent word to me that he had found a Killdeer (*Oxyechus vociferus*) nest. On April 4 his father, Mr. William Belvin, told me there were 3 eggs in the nest. It was not, however, until April 16 that I was able to see the nest. The bird was incubating and remained on the nest until we approached within a few feet.

As far as I have been able to ascertain this is the most southerly record for the breeding of the Killdeer in Florida.

Both Mr. Beaman and Mr. William Belvin have found nests before but did not record the dates. Nevertheless all were found in the same locality.—Bernard H. Stevenson, *2117 Woodford Ave., Fort Myers, Florida.*

Western Sandpiper in Kentucky.—On the Falls of the Ohio River near Louisville, Jefferson County, Kentucky, on July 22, 1939, the writers observed a single Western Sandpiper (*Ereunetes mauri*) feeding among rocks at the edge of the water in the company of Killdeers. The bird was collected and proved to be a female in early fall plumage. Its bill measured exactly one inch in length. This specimen apparently constitutes the first record of the species from Kentucky.—Burt L. Monroe and Robert M. Mengel, *Louisville, Kentucky.*

Short-billed Marsh Wren near Baltimore, Maryland.—The Short-billed Marsh Wren (*Cistothorus stellaris*) seems to be a rather uncommon bird along some parts of the middle Atlantic seaboard. In the long history of observations at Washington, D.C., specimens have been taken only three times, according to Miss Cooke (*Proc. Biol. Soc. Wash.* 42, 1929: 63). It may, therefore, be of interest to record the collection of a female of this species at Loch Raven, Maryland, near Baltimore and only about forty miles north of Washington. The bird was taken on May 11, 1939, in an abandoned upland field dotted with bushes and small trees.—Haven Kolb, *The Natural History Society of Maryland, Baltimore, Maryland.*

The Starling in Mexico.—On February 18, 1939, we saw a flock of about 25 Starlings (*Sturnus vulgaris*) on the Pan-American Highway 9 kilometers south of Nuevo Laredo, Tamaulipas, Mexico. On returning over the same route in June, we failed to note the species. This is apparently the first record of the Starling in Mexico.—Pierce Brodkorb and Arthur E. Staebler, *Museum of Zoology, Ann Arbor, Michigan.*

Swainson's Warbler in Illinois.—On September 1, 1938, I collected a female Swainson's Warbler (*Limnothlypis swainsoni*) and saw another in the dense bottomland near the junction of the Ohio and Mississippi Rivers just south of Cairo, Alexander County, Illinois.

I was surprised to learn from Mr. C. T. Black at the University of Illinois that this is the first known specimen for Illinois although there are several sight records as follows: In the spring of 1878 (April 17 or later) William Brewster and Robert Ridgway (*Bull. Nuttall Orn. Club*, 3, 1879: 163) saw this species several times, heard its song, and even shot one which they failed to recover, at Mount Carmel, Wabash County. Howard Ray and Alfred O. Gross (*Auk*, 25, 1908: 225) heard and saw one on June 17, 1907, four miles north of DuQuoin, Perry County, in a dense growth of willows bordering a low, wet pasture. Arthur H. Howell (*Auk*. 27, 1910: 216) observed this bird several times at Olive Branch, Alexander County, between May 15 and May 20, 1909 and at Reevesville, Johnson County, on June 21 and 22, 1909.

The unossified condition of the skull and small size of the ovary (2 millimeters in length) indicate that my specimen is a first-year bird. It weighed 15.6 grams and was moderately fat. It has been deposited in the U.S. Biological Survey collection in Washington, D.C., as No. 342077.

These records indicate that Swainson's Warbler may some day be found breeding in southern Illinois.—GEORGE ANDREW AMMANN, *U.S. Biological Survey, Milwaukee, Wisconsin.*

Second Occurrence of Brewer's Blackbird in Ohio.—Brewer's Blackbird (*Euphagus cyanocephalus*) was added to the list of Ohio birds April 12, 1936, when I collected a female from a group of three males and two females in Spencer Township, Lucas County (*Auk*, 53: 452). On April 3, 1938, in Jerusalem Township, Lucas County, Ohio, I found 55 of these birds. Within an area of five miles square, four flocks numbering from 75 to 200 "blackbirds"—Starlings, Red-winged Blackbirds, Grackles, and Cowbirds—were checked and Brewer's Blackbirds were found in each of them. The largest number of Brewer's Blackbirds seen in one place was 25 and these showed a tendency to group together when the entire flock was disturbed. Males outnumbered females about five to one. A pair was collected for the Ohio State Museum.

Jerusalem Township borders on Lake Erie and Maumee Bay, and the land, which is old lake bottom, is very flat. All of the Brewer's Blackbirds were found in fields which had been cultivated the previous year and which were a great distance from any patches of forest.—LOUIS W. CAMPBELL, *Toledo, Ohio.*

Nelson's Sparrow in Monroe County, Michigan.—On May 29, 1939, Mr. John J. Stophlet and I flushed a Nelson's Sparrow (*Ammospiza caudacuta nelsoni*) from a grassy area in the Erie Marsh, Erie Township, Monroe County, Michigan. The bird was collected and found to be a female weighing 15 grams. The skin was given to the University of Michigan Museum of Zoology. Seven Nelson's Sparrows have been taken in Michigan previous to this specimen, which is the only one collected in spring (Check List of the Birds of Michigan, J. Van Tyne, 1938).—LOUIS W. CAMPBELL, *Toledo, Ohio.*

A Northern Occurrence of the Grasshopper Sparrow.—A specimen of this species, *Ammodramus savannarum*, was collected by the writer on July 3, 1939, at Pickerel Lake, east of Burk's Falls, Parry Sound District, Ontario. It is a male and is now number 29972 in the Royal Ontario Museum of Zoology collection.

The locality is some fifty miles north of any previous Ontario record in the files of the Museum. Stoke's Bay in the Bruce peninsula (noted on June 1, 1938 by Herbert W. Brandt), Penetanguishene in Simcoe County (noted in June, 1935 by Clifford E. Hope), Bobcaygeon in Victoria County (noted in June, 1931 by Paul Harrington) and Ottawa in Carleton County (two records, June 27-28, 1898 and June 30, 1909 by F. A. Saunders and G. Eifrig respectively) were the northernmost points of occurrence previously reported to the Museum. The Penetanguishene and Bobcaygeon observations were recorded by Paul Harrington and the writer (*Trans. Royal Can. Inst.*, 22, 1937 :270) and the Ottawa occurrences by W. T. Macoun et al (*Ottawa Nat.*, 12, 1899 :265) and G. Eifrig (*Auk*, 26, 1909 :432).—JAMES L. BAILLIE, JR., *Royal Ontario Museum of Zoology, Toronto, Ontario.*

EDITORIAL

It seems essential that we plan to hold our Annual Meeting on the Friday and Saturday following Thanksgiving. As we go to press the officers of the Club and the Local Committee are embarrassed by the sudden announcement by President Roosevelt that Thanksgiving will be proclaimed for November 23 instead of November 30 as everyone had expected. Considerable opposition to this change has been expressed in many States but at this time of writing it appears that the change will be made this year and that most, if not all, States will accept the change. We must therefore announce that the Club's Annual Meeting will be held November 24 and 25, one week earlier than first reported. Announcement of all details will be made in the Secretary's letter to members. We also wish to announce that the dead-line for submitting photographs for the Bird Photograph Exhibit is hereby placed one week earlier. All pictures must be in the hands of Burt L. Monroe not later than November 18.

All indications point to an unusually interesting and worth while meeting. We have never met in Louisville before, but it is most appropriate that we should go to that historic city, so familiar to ornithologists because of its associations with Wilson and Audubon. Founded in 1790 by an Act of the Virginia Legislature, the city was named in honor of Louis XVI of France. It soon became one of the important centers on the Ohio River and both Alexander Wilson and John James Audubon studied birds there. It was in Louisville that their famous meeting occurred in March, 1810.

For our meeting the Brown Hotel has been designated as headquarters, and the photograph exhibit as well as all sessions will be held there. The Brown Hotel is in the center of the city, on Broadway six blocks east of the Union Station.

Members who have attended Annual Meetings will not have to be urged to make every effort to go to this one. Those who have not been able to attend before may be assured that they have awaiting them a delightful and stimulating experience.

We wish to have it clearly understood that we cannot undertake to publish all contributions used in the *Bulletin* in exactly the order received. We endeavor to acknowledge immediately the receipt of all manuscripts. Then, within a few days if possible, we go over the manuscript with care and write the author of its acceptance or rejection. If accepted we will use it in the earliest possible issue. Notes or very short papers will usually be published in the following issue but longer contributions may have to be held over one or two issues. The choice of papers for a given issue of the *Bulletin* must be determined by a number of factors, such as, diversity of subject matter, timeliness, length, number and cost of illustrations.

Ornithological News

The Fifty-seventh Annual Meeting of the American Ornithologists' Union was held at the University of California, Berkeley, and at the California Academy of Sciences, San Francisco, June 19 to 24. There was a registered attendance of 248. James P. Chapin was elected President, James L. Peters and George Willett Vice-Presidents, Lawrence E. Hicks Secretary, and Rudyerd Boulton Treasurer. New members elected to the Council were Percy A. Taverner, Ludlow Griscom, and Alden H. Miller. Two Fellows were elected: Alden H. Miller and George Willett. New members elected were: Emmet R. Blake, Louis W. Campbell, Owen J. Gromme, Joseph A. Hagar, Paul Kellogg, Wesley F. Kubichek, Ivan R. Tomkins. The

Brewster Medal was awarded posthumously to Witmer Stone for his two volume work on "The Birds of Old Cape May." The next meeting will be held in Boston in October, 1940.

Donald W. Douglass, formerly of Texas Technological College, has been appointed Ornithologist of the Game Division, Michigan Department of Conservation.

William Vogt is having a successful year in Peru studying the guano birds for the Compania Administradora del Guano of Lima. At last report 9,000 cormorants were banded, and he had ordered 100,000 more bands.

Lawrence H. Walkinshaw and Edward M. Brigham, Jr., have become editors of *The Jack-Pine Warbler,* official organ of the Michigan Audubon Society.

Leonard Wing has been appointed Assistant Professor of Game Management at Washington State College, Pullman, Washington.

WILDLIFE CONSERVATION

The Wilson Ornithological Club's Wildlife Conservation Committee proposes to print regularly in this section of the *Bulletin* a summary of information it has gathered and recommendations it wishes to make. Opinions and factual contributions of members are solicited.

In view of the discussions there have been concerning the desirability of the Club's participating in Conservation activities we are taking the liberty of quoting from a personal letter received by your Chairman from one of America's greatest ornithologists, the late Joseph Grinnell. He wrote, "Your report of the Club's Conservation Committee looks good to me, and I hope that you make efforts along the lines indicated. I, too, out here find on the part of a few Cooper Club members an expressed reluctance or aversion to this Club's participating in any sort of 'propaganda' campaign. But I usually find this feeling traceable to certain government or state agencies whose policy seems to be to 'educate' the public to leave guidance in all those matters *to* those agencies! Observation through the years leads me to believe that in the interests of preservation of wildlife in its totality, said agencies cannot alone be trusted to act always effectively. It is well to have participation widely and audibly by organizations *outside* of the government, such as the Wilson Club, the Cooper Club, and the A.O.U."

There have been some very encouraging developments in the last year or two in Missouri. Following the passage of an amendment to the State constitution in November 1936, placing the administration of wildlife affairs in Missouri in the hands of an unsalaried, non-political commission, the new Commission has won the first two test-cases before the Missouri Supreme Court:

(1) In the spring of 1938, the Court upheld the power of the Commission to select its Director (Mr. I. T. Bode) without regard to geographic origin.

(2) In the fall of 1938, the Court upheld the power of the Commission to make regulations having the force of law.

Both these powers were clearly stated in the text of the constitutional amendment, but they were challenged and the Commission's powers in these respects have now been confirmed.

In the 1939 Missouri Legislature two moves designed to cripple the work of the Commission were decisively beaten, largely through the influence of the active and independent Conservation Federation of Missouri. These moves were:—

(1) To submit to the electorate, in the fall of 1940, a proposed constitutional

amendment repealing the "conservation amendment" of 1936. This would have necessitated an entire new campaign.

(2) To repeal all provisions of the existing game laws that had been carried over from the former Game and Fish Department. This would have nullified the laws providing the income of the Commission and penalties for infractions of its regulations, and the Commission would have been virtually without income or police power until another Supreme Court case could be decided.

The creed of the new Missouri Conservation Commission is clearly environmental improvement and public cooperation. The State is discontinuing the production of artificially-reared quail and is reducing all liberations to a minimum. At the same time it is emphasizing managed environments and over 1,000,000 acres, exclusive of Federal and State-owned lands, are under cooperative management plans. An example of the Commission's activities along this line is the issuance of a carload (33,000 lbs.) of Korean lespedeza seed to conservation and agricultural organizations in 4/5 of the counties of the State; this was planted in over 1,700 miles of 16-foot strips along field borders, where cover was present but food was scarce.

The laws relating to non-game birds in Minnesota are reasonably satisfactory except as they apply to the hawks and owls. All wild birds except the "English Sparrow, blackbird, Crow, and all species of hawks and owls" are protected. In 1903 the A.O.U., or Audubon Society "Model Law," which did protect the hawks and owls, was passed, but in 1925 it was rescinded through the efforts of the sportsmen who believed in "vermin" control. Since then there have been many "vermin" eradication campaigns sponsored by sportsmen's organizations or the State Division of Game and Fish, in which Crows, hawks and owls, foxes, mink, gophers, spermophiles, etc., have been persecuted. It is needless to state that the hawks and owls destroyed in such campaigns are usually overwhelmingly the more beneficial species, and that the misdirected "conservation" efforts are resulting in much more harm than good. In fairness it must be said that through the efforts of the State Biologist, C. Gordon Fredine, the Conservation Department has been persuaded to remove the more beneficial hawks and owls from the list of species upon which it officially sponsors control campaigns. Sportsmen's organizations continue, however, to conduct hawk and owl "shoots" under the guise of conservation.

It must be recognized that while a change in the law is desirable, the primary need is for education of the general public in scientific conservation principles, because only if the general public understands the situation and is sympathetic, can protective legislature be truly effective. While legislation protecting the more beneficial hawks and owls in Minnesota may not find the general public in an entirely receptive mood, it seems certain that it would do much to prevent the wholesale slaughters that occur in the hawk and owl shooting contests, and it would undoubtedly hasten the processes of education to have such a law on the statute books.

Sporadic attempts have been made from time to time to effect a change in the present law, but the bird students and others in a position to direct a scientific attitude toward the problem have not made the necessary united and concerted effort. Last winter W. J. Breckenridge, G. S. Swanson, and others drew up a bill which provided for the adding of all hawks and owls, except the "Accipiter group" and the Great Horned Owl, to the list of protected birds. This was endorsed by conservation organizations but ended finally among the bills not acted upon by the legislature in the final rush of business.

—Wildlife Conservation Committee
Miles D. Pirnie, Chairman.

ORNITHOLOGICAL LITERATURE

LIFE HISTORIES OF NORTH AMERICAN WOODPECKERS. By Arthur Cleveland Bent. United States National Museum Bulletin 174, 1939, 334 pp., 39 pls. $.50 of Supt. of Documents, Wash., D.C.

Each of Mr. Bent's "Life Histories" is a mine of information on distribution, plumages, voice and "habits," and one marvels at the amount of patient labor represented. We owe a great debt to Mr. Bent, and the books with their fine photographs and entertaining text with quotations gathered from far and near are a bargain at the prices asked.

In going through this volume on woodpeckers, one is impressed with the shocking gaps in our knowledge of the elementary facts such as length of incubation and fledging, and definite information as to share of the sexes in the care of the young even in our most common species. Apparently the nest life of only one species has been adequately studied in this country, namely the Yellow-shafted Flicker by Miss Althea Sherman and this study is a masterpiece. Our knowledge of our woodpeckers compares most unfavorably with that in England and Europe.

Some important information has been missed: A. F. Skutch's "The Male Flicker's Part in Incubation" (*Bird-Lore*, 39, 1937: 112–114), and G. K. Noble's "Courtship and Sexual Selection of the Flicker (*Colaptes auratus luteus*), (*Auk*, 53, 1936: 269–282). The importance of Shelley's instance of inbreeding Downy Woodpeckers is not pointed out, nor is his third item on the brother-sister pair, telling of their nesting together for four years (*Bird Banding*, 7, 1936: 135) given; no mention is made of the communal nesting of the California Woodpecker, and little use has been made of the files of *Bird Banding*, in which many items appear on age, dispersal, etc.

Some quotations might better have been omitted: the accounts of Gairdner's and Pileated Woodpeckers with eggs throwing out chips "as a ruse to deceive," (pp. 49, 191); of Red-shafted Flicker parents' placing food in crevices to teach the baby to pick it out (p. 290), and the "learning by experience" of California Woodpeckers that did not store acorns extensively until after a "lean year" (p. 218). As to the first instance of intelligence, against what enemy but an egg collector would it be successful? As to the second, I feel sceptical until I hear of more instances. The third seems to call for higher mental ability than we would expect in a bird that sometimes stores acorns in places where it cannot retrieve them or even fills the bark of trees with pebbles.

It was a pity to include G. W. Morse's record of a Red-cockaded Woodpecker nesting in a willow near Tulsa, Oklahoma; Tulsa has oak-hickory savannah on one side and prairie blue-stem on the other, but is a hundred miles away from the pine forests in which this species is a very rare resident, having been recorded some seven times in the last 47 years. (The range extends only to *southeastern* Oklahoma, not to northeastern as stated (p. 79), the records from Copan and Tulsa being erroneous.) Mr. Morse was carried away by enthusiasm for new records, and many of his "finds" had to be ignored by other workers in the State. In May 1926 he sent me a sketch of his Red-cockaded Woodpecker that decidedly did *not* match this species, but had considerable resemblance to a Downy Woodpecker.

Woodpeckers are a particularly interesting group of birds. Sexually dimorphic as a rule, at times strikingly so, but occasionally both sexes alike; the male incubating and brooding at night and doing more than his share of the care of the family; short incubation periods; usually rather anti-social, but at times the opposite—woodpeckers in this country offer an almost unexplored field for intensive life history and behavior studies.—M. M. Nice.

THE MIGRATION OF AMERICAN BIRDS. By Frederick C. Lincoln. Doubleday, Doran & Company, Inc., New York, 1939: 7½ x 10 in., xiv + 189 pp., 12 pls., 22 figs. $4.00.

One who desires to read a popular book on bird migration will find Frederick C. Lincoln's "The Migration of American Birds" the very volume he is looking for. There are twelve chapters written in a straightforward, concise style that provides easy and quick reading. Together these chapters review the history of migration and what is known of its origin and evolution, the mechanics, dangers, times, and various types of migration, the distances covered in migration, the flyway systems of American migration, and bird-banding as a method of migration study. The two latter subjects are discussed at great length, and appropriately so, for the author, as Chief of the Section of the Distribution and Migration of Birds in the Bureau of Biological Survey, has studied the flyway systems in detail and has been one of those in charge of bird-banding in this country for many years.

One who has read other books on bird migration, whether popular or technical, may be disappointed in the contents of the present volume. There is little freshness in presentation and information. New facts and hypotheses are to be found but they do not receive deserved emphasis; too often they are submerged by the already well-known, spectacular findings of bygone days. Two statements are based on inaccurate information. The "hummingbird" (p. 26) is said to make possibly 200 wing strokes per second, whereas motion-picture film from the Edgerton-Germeshausen-Grier stroboscopic high speed camera has shown that the Ruby-throated Hummingbird beats its wings from fifty to fifty-five times per second while hovering and seventy-five times per second when in forward flight. The Cape May Warbler (p. 88) is said to breed in "northern Michigan and northern Minnesota" but no nests have ever been found in either of these States.

The author has found it impractical in a popular book of this sort to credit all writings from which information has been taken, to name the persons conducting important investigations, and to include the names of banders when banding records are cited. Too numerous references and names quite obviously detract from the general story. But the reviewer takes strong exception to the fact that no bibliography whatever is included, that important investigators' names are not mentioned anywhere in the text, and that a list of persons who have cooperated extensively in bird-banding is not given. If a layman's interest is to be stimulated by this book, he will want to read further with the aid of a bibliography; if a reader becomes fascinated by a certain investigation, quite naturally he will be curious to know the person's name; if numerous individuals are to continue their cooperation with the Biological Survey by bird-banding, they will certainly expect encouragement by simple recognition when the records they have helped establish are used.

The book is attractively bound and printed and there are a satisfactory number of maps illustrating various types of migration. The color plates are unbelievably poor reproductions of the extremely beautiful paintings done by Louis Agassiz Fuertes for Eaton's "Birds of New York." The colors in no way match the accuracy of the originals, the artist's signature and side sections of the paintings have in some instances been partially blocked out, and a general haziness prevails. The misuse of such masterly paintings is deplorable.—O. S. Pettingill, Jr.

NOTES ON THE BIRDS OF TENNESSEE. By Alexander Wetmore, Proceedings of United States National Museum, 86, No. 3050, 1939: 175–243.

The National Museum has recently commenced a "biological survey" of the east-central States. The present paper reports on 186 forms of Tennessee birds

seen or collected by the museum's field parties during 1937. Reference is also made to older specimens, now in the National Museum, collected by W. H. Fox and A. H. Howell. The form and style are similar to Dr. Wetmore's previous paper on West Virginia birds.

A number of species were critically studied, and the author resurrects several names usually relegated to synonymy, as well as recognizing a number of newly described races. Reference is usually, though not always, given to nomenclatorial changes since publication of the last A. O. U. Check-List. The type specimen of *Quiscalus versicolor* Vieillot was examined in the Paris Museum and found to be the same as Ridgway's *aeneus*. This necessitates the use of the former name for the Bronzed Grackle, which Wetmore considers to be a full species.

We note some ten races, mostly western forms or recently described subspecies, which are apparently additions to the avifauna of the State, but there is no indication in the text that such is the case.

A brief description of the faunal divisions of Tennessee would have been useful, especially to the reader unfamiliar with the region.

The main value of this report, aside from its rather considerable local interest, is in the careful revisionary work included, which will have an influence far beyond the geographic scope of the paper.—P. Brodkorb.

Food Habits of North American Diving Ducks. By Clarence Cottam, U. S. Dept. Agric. Tech. Bull. No. 643, 139 pp., 10 pls. (4 color pls. by Allan Brooks). April, 1939. $.30 of Supt. Doc., Wash., D.C

Without doubt this is the best publication on the feeding habits of ducks which has appeared in this country The author has made full use of stomach analyses by the Biological Survey, but also he has drawn on the findings of other investigators to give a more complete picture of food preferences. Results are based on analyses of 6,665 adult and 140 juvenile stomachs. Mergansers are not included. The "inland divers," excepting the Greater Scaup, are found to be predominantly plant feeders, while the reverse is true of the sea ducks. Tables show the volumetric percentages of the various foods of each species, and other tables summarize the findings concerning the plant feeders and the animal feeders. Ninety-seven titles are listed, an indication of the thoroughness which characterizes this study.

This is a most valuable presentation of new information and summary of published material. It is ably and interestingly presented.—M. D. Pirnie.

Food of the Game Ducks in the United States and Canada. By A. C. Martin and F. M. Uhler, U. S. Dept. Agric. Tech. Bull. No. 634, 156 pp., colored frontispiece, and 152 uncolored plates. March, 1939. $.40 of Supt. Doc., Wash., D.C.

Part 1 is a summary of the duck foods data in the Biological Survey files, as indicated by the examinations of 7,998 stomachs of 18 duck species, chiefly by McAtee, Mabbott, Kubichek, Holt, Cottam, Kalmbach, Sperry and Uhler. Tables show the volumetric percentages and frequency for the more important items. For all regions combined, plant foods amounted to about 73 per cent and animal foods almost 27 per cent. In one region the animal foods equaled as much as 46 per cent and in another as low as 7 per cent, no doubt partly due to the season in which the collections were made.

Part 2 gives a very detailed account of the better-known food plants, touching upon: "value for food, parts consumed, identification, environment, propagation, and related species." Maps give the principal range, region of greatest abundance, and isolated records for nearly all the plants discussed. Of 83 pages, only 5 are

devoted to animal foods. Eight plates illustrate the animal food types and 144 plates (all in black and white) depict the plant foods, habitats, and the contents of a few stomachs.

Part 3 deals thoroughly with the propagation of food plants and the development of feeding grounds—a most timely and useful presentation for wildlife managers—with plenty of good material for students of any phase of aquatic or marsh ecology. A bibliography of 91 titles is followed by the 152 uncolored plates and an index.

The reviewer of such a comprehensive publication is at a disadvantage, for who outside of the Biological Survey has a continental grasp of this subject? At once the many merits of this report will be discovered. Here is a very comprehensive and no doubt accurate presentation of the essential facts about most of the better known and most commonly used plant foods of the ducks. This is the only publication which at all covers this subject, and it is a very fine job. It is much to be regretted, however, that the plan of the work over-emphasizes the importance of plants and will leave most readers unaware that animal items probably would have made up from a third to a half of the menus of nearly all ducks, if adequate samplings had been available for all months of the year. Utah, Wisconsin, the lower Mississippi, and the coastal regions are best represented, but locality representation is far from satisfactory. There were only 44 stomachs for Manitoba, 47 from Michigan, and only 20 from Minnesota—to represent not one, but 18 species! A careless reader may be misled by the graphic representation of the plant food volumes, a treatment omitted with the animal foods. The authors have frankly stated the handicap of having to make collections from only 247 localities serve for so large an area, and they have tried to make certain adjustments by "scaling down" the data from poorly represented areas; but this cannot make up for such lack of data as having only 25 Black Duck stomachs for the entire "Eastern Region!" Perhaps a "species by species" treatment is best, after all, in presenting the food habits of birds.

This bulletin should be in the hands of all who are seriously interested in marsh and aquatic plants or in the foods used by our native ducks.—M. D. Pirnie.

MOULTS AND SEQUENCE OF PLUMAGES IN THE ROCK PTARMIGAN (LAGOPUS MUTUS (MONTIN)). By Finn Salomonsen, *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening*, 103, 1939: 1–491, figs. 1–57, folding pls. 1–7.

Following Jonathan Dwight's epoch-making studies of avian molts and plumages there was a period of lessened activity in this interesting field of research. Fortunately, of recent years these studies have steadily increased in number and excellence and now we have a large book devoted to an account of the molts and plumages of a single species.

In the preparation of this thorough study the author examined molting birds in the field (in Greenland) and then worked over nearly 1,300 museum specimens of this species as well as more than 250 specimens of the Willow Ptarmigan and 300 specimens of certain weasels and other mammals which similarly turn white in winter. The specimens belonged to 23 different museums (including 3 New World institutions), a fine example of the cooperative nature of the best modern museum research.

Ptarmigan, of course, molt three times a year and, as the author shows, the process is a complicated one. He describes the molts as fully as his material allowed and makes a determined, if not wholly successful, effort to learn the causative factors. He states that the molt into white plumage takes place quite independently of the presence of snow cover and that the whiteness seems not to be

primarily of importance as a protective coloration factor—rather it is "no doubt a thermo-regulating adaptation." The author also confirms the report that ptarmigan are more extensively and densely feathered in the winter plumage. There is no space here even to mention other of the author's many interesting conclusions but the book is one of outstanding importance which everyone interested in the molts and plumages of birds will have to study carefully.

The book concludes with an excellent bibliography of 318 titles and a 35 page Danish abstract, the quality of which we did not test.—J. V.

BIRDS OF CANADA. By P. A. Taverner. David McKay Co., Philadelphia, Pa., 1938: 6½ x 9 in., 445 pp., 488 text figs., 87 col. pls. $4.00.

This is an American edition, unchanged except for minor corrections, of the author's well known and widely used "Birds of Canada," first published by the National Museum of Canada in 1934. Many of the illustrations and notes on field characters will prove extremely helpful to students whose activities are confined to northern United States.—J. V.

THE LIFE HISTORY OF HENSLOW'S SPARROW, PASSERHERBULUS HENSLOWI (AUDUBON). By A. Sidney Hyde, University of Michigan Museum of Zoology Misc. Publ. No. 41, July [issued Aug. 8], 1939, 72 pp., 4 pls. $.75.

To the growing list of American birds singled out for special, intensive study over a number of seasons may now be added the Henslow's Sparrow. If the results of three seasons' work, as presented in the paper here under review, are less exhaustive and complete than in the case of other species so treated, we must remember the unusual difficulties attendant upon watching so elusive and inconspicuous a bird and assume more an attitude of thanks for what the author has been able to gather than of criticism for the gaps and omissions. However, the latter are so conspicuous that we may well ask ourselves if it would not be better to leave ecologically "difficult" forms to those so situated as to spend many, many years on them, and direct our studies to those equally interesting birds that lend themselves more readily to the life history investigator. It is rather surprising to find a monographic account of a sparrow with almost no mention of the whole question of territory (and no real data on it), and with all too little on the subjects of courtship and mating, especially in view of the possibility of promiscuity that is hinted at in the loose social organizations mentioned by the author. Even in topics where the data available are more extensive, the treatment is somewhat inadequate. Thus, the data on distribution and migration are unfortunately compiled by States (with a rather perfunctory summary, at least as far as migration is concerned) instead of worked into a more readily comprehensible picture that would serve the reader to better advantage and be more translatable into the biology of the bird. There is disappointingly little on local migration in the area where the author did his field work; nothing at all involving any intensive study.

In those sections dealing with the nest, eggs, and young, the author makes his fullest contributions to our knowledge of Henslow's Sparrow. The female builds the nest without any assistance from the male (how were the sexes distinguished with certainty?), but it seems that both parents feed the nestlings. The incubation period is surprisingly short,—ten to eleven days, and the nest life of the young is also very brief,—nine or ten days. Is this an adaptation to the fact that dangers beset chiefly the eggs and nestlings? Henslow's Sparrow should be compared with other ground nesting sparrows with this in mind.

The author avoids the question of the two subspecies *henslowi* and *sussurans*, merely stating that, " . . . conclusions are withheld until the evidence becomes more complete." It seems to the reviewer that ample evidence could have been gotten together from our various museum collections to enable the author to settle this point. On the whole, the reviewer has an impression that the author has brought together all that was previously known of this bird, but that he has not added to it as much as might have been hoped for from three seasons in the field. Field studies at best are beset with difficulties; why pick birds that seem to increase the obstacles to accurate observation?—Herbert Friedmann.

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